Prepared for:
Ronald McDonald House Charities
of Chicagoland and NW Indiana
Chicago IL

Work Plan for Remediation of Radiologically-Impacted Soil at 211 E. Grand Ave.

AECOM.
December 2010
Project No.: 60157402

AECOM
750 Corporate Woods Parkway
Vernon Hills, IL 60061

847-279-2500 tel
847-279-2510 fax

December 10, 2010

Ms. Vernata Simon
U. S. Environmental Protection Agency – Region 5
77 W. Jackson Blvd., SE-5J
Chicago, Illinois 60604

Subject: Work Plan for Remediation of Radiologically-Impacted Soil, 211 East Grand Ave, Chicago, Illinois, AECOM Project No. 60157402

Dear Ms. Simon:

Enclosed please find the Work Plan for the above-referenced site for your review and comment. Per your request, we have provided a single hardcopy for your use. An email with the document attached in PDF format has been forwarded to your attention. Please note that this work plan includes the results of the down-hole and surface screening completed in September 2010.

Please contact us with any questions or comments you may have regarding the plan.

Yours sincerely,

FOR

Steven T. Newlin, P.G.
Senior Project Geologist

Steven C. Kornder, Ph.D.
Senior Geochemist

cc: Doug Porter, Ronald McDonald House Charities
Davic Gutierrez, Daccord
Vince Oleszkiewicz, Duane Morris

Contents

1.0 Introduction 1-1

2.0 BACKGROUND 2-1

2.1 Site Location 2-1

2.2 Site History 2-1

2.3 Site Lithology and Groundwater Conditions 2-2

2.4 Down-hole Radiological and Test Pit Surveys 2-2

2.5 Radiological Surface Screening of the Former Loading Dock Driveway 2-3

3.0 PROPOSED WORK ACTIVITIES 3-1

3.1 General Description 3-1

3.2 Historical Fill Screening 3-1

3.3 Excavation of Radiologically-impacted Soil 3-1

4.0 METHODS 4-1

4.1 Applicable Cleanup Standard 4-1

4.2 Surficial Walk-over and Grading Surveys 4-1

4.3 Confirmation Surveys for Radiologically-Impacted Areas 4-2

4.4 Verification Sampling 4-3

4.5 Materials Management 4-3

4.6 Data Management and Report 4-4

4.7 Exclusion Zone Access and Security 4-5

4.8 Decontamination 4-5

4.9 Temporary Storage of Radiologically-Impacted Material 4-6

5.0 HEALTH AND SAFETY PLAN (HASP) SUMMARY 5-1

5.1 Key Personnel 5-1

5.2 Potential Hazards 5-1

5.3 Training and Communications 5-2

5.4 Personal Protective Equipment 5-3

5.5 Air Quality Monitoring 5-3

5.5.1 Personal Exposure Monitoring 5-3

6.0 COMPLETION DOCUMENTATION 6-1

List of Appendices

Appendix A	AECOM Radiological Survey Results Report
Appendix B	Gamma Spectroscopy Results – Sample Collected September 16, 2010
Appendix C	Field Gamma Survey Form
Appendix D	Standard Operating Procedures
	SOP-210 Gamma Radiological Surveys SOP-212 Air Monitoring Procedure SOP-214 Soil Sampling Procedure SOP-215 Field Logbook Procedure SOP-217 Excavation Procedure SOP-223 Verification Survey SOP-343 Operation of Ludlum Model 2221 Scaler/Ratemeter with Ludlum Model 44-10 2"x2" NaI Scintillation Probe SOP-345 Survey for Surface Contamination and Release of Equipment for Unrestricted Use SOP-347 Decontamination SOP-364 Sample Preparation Procedures for Gamma Spectral Analysis
Appendix E	Plans
	Dust Control Plan Emergency Contingency Plan Verification Sampling Plan
Appendix F	Specifications
Section 01010	Summary of Work Section
	01020 Construction Health and Safety Section 02010 Demolition and Debris Removal Section 02200 Contaminated Material Loadout and Earthwork Section 02840 Site Utilities
Appendix G	Health and Safety Plan

List of Figures

Figure 1 Site Location Map

Figure 2 Project Management Organization Chart

1.0 Introduction

This Work Plan was developed for radiological investigation and the potential removal of radiologically-impacted fill soil from 211 East Grand Avenue parcel (Site). The Site is now a vacant lot, which formerly was occupied predominantly by a 4-story brick building with a basement and adjoining 2-story brick buildings. The Site has been investigated as part of the planned development by Ronald McDonald House Charities of Chicagoland and Northwest Indiana. The proposed structure will be a 14-story Ronald McDonald House. It will be a cast-in-place poured concrete structure without a basement. The hotel type building will be 198-feet in height and has been designed to be supported on caissons. The Work Plan describes the:

- Survey methods proposed for identifying potentially radiologically-impacted materials above the 7.1 picocuries per gram (pCi/g) cleanup threshold (the "Applicable Cleanup Standard") within the footprint of the Site (the "Work Area").
- Procedures for managing the removal of radiologically-impacted soil within the Work Area above the Applicable Cleanup Standard.
- Closure Report and Documentation of the work activities performed relating to the removal of radiologically-impacted fill soil, including health and safety procedures.

Following review and approval of this Work Plan by United States Environmental Protection Agency (USEPA), activities will begin with a walk-over survey of the former loading dock driveway in the northeast corner of the property where elevated gamma readings were observed. Subsequent subsurface activities will be directed toward the identification and remediation of radiologically-impacted fill soil above the Applicable Cleanup Standard that would be disturbed during construction related activities. Finally, additional radiological screening activities will occur during construction whenever previously unscreened historical fill materials are excavated. This screening will occur during activities such as the installation of shoring, caissons, utilities, etc.

Prior to transport for disposal, the containerized (super-sack) radiologically-impacted fill soil will be temporarily stored on-site. Radiologically-impacted fill soil above the Applicable Cleanup Standard that is excavated will be transported to a disposal facility licensed to dispose of this material. After completion of the surveying and remediation, a report will be prepared documenting the activities, unsurveyed areas and any known radiologically-impacted fill soil that remains on-site. The report will also request that USEPA prepare a "Certification of Completion Letter" acknowledging that conditions at the Site are protective of human health and the environment and that the investigation and removal activities were completed in accordance with the work plan.

2.0 BACKGROUND

2.1 Site Location

The Site is about 75-feet wide and 100-feet deep or approximately 0.17 acres. It is bounded by East Grand Avenue on the north, a public alley on the south and brick and/or concrete block buildings immediately adjacent to the eastern and western property lines (refer to Figure 1). The Site is located in an area of reclaimed land where fill soil material was placed along the Lake Michigan shoreline starting in the 1860's. This area of Chicago is commonly referred to as Streeterville. Recent developments in the Streeterville area of Chicago encountered radiologically-impacted fill soil. The radiologically-impacted fill soil was originally generated as a byproduct from a former gas mantle production that used thorium nitrate in its manufacturing process. The manufacturing operations were located at 316 East Illinois Street and 161 E. Grand Street in Chicago, Illinois. These manufacturing operations were conducted from the early 1900s through the early 1930s. The radiological impacts consist of elevated concentrations of thorium in the near surface fill soils in the vicinity of the former Lindsay Light site.

Cleanup of radiologically-impacted fill soil has been performed at several Streeterville properties under the direction of the U. S. Environmental Protection Agency (USEPA). Due to the proximity of this property to the manufacturing site and documented cleanups at other properties in the Streeterville area, screening for thorium-impacted fill soil is warranted where invasive work is planned. Furthermore, the USEPA, which has oversight authority for radiologically-impacted sites, requests that radiological surveys be completed prior to and during site development within the moratorium area commonly referred to as the Streeterville thorium investigation area.

2.2 Site History

Prior to the recent demolition activities completed in April 2010, the Site was occupied by a four story commercial brick building with a full basement. The building was approximately 52-feet wide by 100-feet deep, situated in a north-south orientation, and abutted the southern, northern and western property lines. This structure was likely built in 1887 according to the Phase I completed in March of 2008 by Gabriel Environmental Services. As such, the building was built approximately 15 years prior to the founding of the Lindsay Light Company in Streeterville. Therefore, the presence of Lindsay Light thorium material below the basement floor and building footings would not be anticipated.

A two story brick building occupied the southeast corner of the Site. This structure was approximately 24-feet wide and 40-feet deep and abutted the alley to the south as well as the eastern property line. This structure reportedly did not have a basement. North of this two story building was a paved loading dock driveway approximately 24-feet wide and 60-feet deep that was accessed from East Grand Ave. Thus, the eastern one-third of the Site, which measures 24-feet by 100-feet, appears to have been previously unexcavated.

On November 11, 2009 the USEPA conducted a walk-over radiation survey of the Site including the loading dock area and basement, which included four test pits that had been installed to obtain structural information. Results from the survey were summarized in correspondence from the USEPA dated November 16, 2009. A copy of this correspondence is included as an attachment to the radiological survey report in Appendix A. According to the USEPA, the survey results did not indicate the potential presence of radiologically-impacted fill materials in either the alley or the basement. In a letter date April 28, 2010, the USEPA indicated that based on the survey results and age of the building, that it was unlikely that subsurface thorium contamination would be present. In the same letter the USEPA requested that radiological monitoring be performed in the planned geotechnical borings and indicated concern that contamination may be present off-site below the asphalt in the alley to the south.

2.3 Site Lithology and Groundwater Conditions

The geotechnical investigation was conducted in late June and early July 2010 and installed three boring to collect data regarding the subsurface soil conditions. Two of the three boring were installed within the footprint of the former 4-story building. The basement of this former four-story building was backfilled with the demolition debris from the original structure. Thus, only one boring (B10-1) located in the former loading dock driveway was installed in previously undisturbed historical fill soil. Groundwater was noted in the borings at depths varying from 11.5 to 14.5 feet below grade during the drilling operations

The soil conditions encountered at this boring consisted primarily of sand, gravel, broken brick and miscellaneous fill materials from surface grade to approximately 7-feet below surface. Beneath the urban fill, native, moist to saturated sand was encountered to depths of approximately 20 to 21.5 feet below grade. The sand typically contained a high percentage of coarse-sized sandy particles and appeared to be an alluvial outwash. A 6-inch thick layer of gravel was encountered below the sand at a depth of 20-feet in boring B10-1. Below the native sand, to a depth of about 52.5-feet, silty clay was encountered that had stiffness varying from stiff to very stiff. The top of hard pan (very hard silty clay) was encountered at an approximate depth of 82.5 feet below grade.

2.4 Down-hole Radiological and Test Pit Surveys

A report with the results of the down-hole radiological survey was submitted to the USEPA in October 2010. These results are summarized in this section and a copy of the report is included in Appendix A. The down-hole radiological survey scope included the screening of three geotechnical borings installed and four shallow borings south of the Site within the public alley. Two of the three geotechnical borings were located within in the boundary of the former basement, which had been filled with debris (brick and concrete) from the demolition of the building.

The primary purpose of the borings in the alley was to determine if radiologically-impacted fill soil was present per the request of the USEPA, but the borings could not be completed due to the presence of underground utilities. Two of the borings were moved north and completed just inside the property line. However, the other two borings were not completed since the primarily intent was to assess fill soil presence in the alley and moving them to the edge of the alley would limit their ability to assess alley fill material. Thus, down-hole radiological surveys were completed at five of the borings to evaluate the potential presence of radiological materials.

The down-hole radiation surveys for the five soil borings were conducted between August 24 and September 3, 2009. Surface screening of the spoil generated revealed no indication of soils above the specified Cleanupthreshold established by the USEPA for the Streeterville area of Chicago. Down-hole gamma readings for the two geotech borings completed within the demolition debris and the two borings along the alley were well below the field instrument equivalent to the Applicable Cleanup Standard. As previously indicated, the presence of Lindsay Light thorium material below the basement floor and/or building footings would not be anticipated since the building was built approximately 15 years prior to the founding of the Lindsay Light Company in Streeterville.

The only anomalous readings observed were at boring SB-10-1 where the gamma reading observed at 2.5-feet exceeded the instrumentation threshold based on the Applicable Cleanup Standard. SB-10-1 is located in former loading dock driveway in the eastern one-third of the Site which does not appear to have been previously excavated. Additional investigation was performed, specifically the excavation of a shallow test pit in the vicinity of the elevated gamma readings.

The SB-10-1 boring is located in a former drive way and/or loading dock area (refer to Appendix C), which was not included within the building footprint. Thus, there is a potential for fill materials to be present in this area. Since there was only one measurement that was slightly over the instrument equivalent to the Applicable Cleanup Standard, there was a possibility that the field instrument was reading natural radioactivity present in

brick and/or granite paver materials. As such, a plan to visually examine the materials contributing to the elevated gamma reading was coordinated with a testing pitting effort to observe the foundations of the adjacent structures on September 16, 2010.

The excavation of the test pits was performed using a bobcat. The radiological test pit was located in the vicinity of boring SB-10-1. The pit was located about 10-15 feet south of the East Grand Avenue sidewalk. Higher readings appeared to be occurring toward the southern edge of the test pit. Therefore, the test pit was extended approximately 10-feet farther south. In this southern section of the test pit the readings ranged from 19,000 to 21,000 cpm at a depth of about 18-inches. However, fill material removed from the test pit remained below the Applicable Cleanup Standard. The fill soil in the test pit at the base of the excavation, where elevated readings were observed, consisted of tan to black colored sand to gravel size material with cinders, ash and some brick/concrete debris. No pavers or appreciable brick material was present. When it was apparent that soil fill above the Applicable Cleanup Standard was present, excavation activities were halted to avoid the excavation of impacted material and the test pit was backfilled.

It should also be noted that two geotechnical test pits along the eastern property boundary were completed to observe the foundations of the buildings for foundation design purposes (refer to report in Appendix A). No indications of radiologically-impacted soil fill above the Applicable Cleanup Standard were observed.

2.5 Radiological Surface Screening of the Former Loading Dock Driveway

After back filling of the boring test pit, a radiological surface survey of the remainder of the former drive was performed on September 16, 2010. It is estimated that the former drive was about 24-feet wide and extended south about 60-feet from the sidewalk on East Grand Avenue. The lowest readings were generally along the eastern property boundary. The highest gamma reading occurred toward the western edge of the former drive. The surface reading in the western section ranged from 15,400 to 20,700 cpm with a maximum of 52,000 cpm about 41 feet south of the sidewalk and 17 feet west of the eastern property boundary. Although readings at the surface were slightly elevated, it appeared the surface material in the western portion of the drive may not be above the cleanup threshold and that the instrument may be measuring elevated/impacted material below the surface. This would be consistent with the readings recorded at boring SB-10-1.

Hand excavation of a small area to a depth of about 1-foot at the highest surface reading indicated a maximum of 106,000 cpm versus the instrument cleanup threshold of 17,522 cpm. A sample of the material at this depth was obtained and submitted for high resolution gamma spectroscopy analysis. The results of the analysis are included in Appendix B and indicate a total radium concentration of 44 pCi/g, which is above the Applicable Cleanup Standard (7.1 pCi/g total radium) set by the USEPA for the Streeterville area. Thus, an area just below the current surface estimated about 6 by 40 feet exhibits total radium concentrations consistent with Lindsay Light thorium material. This zone of potentially impacted material is parallel to the former building foundation on the western side of the former loading dock driveway.

3.0 PROPOSED WORK ACTIVITIES

3.1 General Description

There are two major tasks that comprise the investigation and proposed remediation of the Site. The initial task will involve a surface gamma survey of the exposed surface of the former loading dock driveway and the excavation of radiologically-impacted material exceeding the Applicable Cleanup Standard. In addition, screening for radiologically impacted material will be completed whenever construction activities will result in the disturbance of historical fill that has not been previously screening. These activities may include the installation of utilities, shoring, grade beams, caissons, etc.

3.2 Historical Fill Screening

Excavations in historical fill that have not been previously surveyed will be screened for the presence of radiologically-impacted material. These surveys will be conducted consistently with the methodology for excavations in Sections 4. Surveys will use a Ludlum 2221 and 2 x 2 NaI probe. The background gamma count will be recorded. Screening of the excavations may include three survey efforts including: the excavation walls and floor, excavated soil while still in the excavator bucket, and the excavation spoil piles.

The excavations will proceed in lifts not to exceed 18-inches per lift. The excavation walls and floor will be surveyed at each 18-inch lift if the excavation can be entered safely or the probe can be suspended into the excavation via a longer cable. In the event the excavation is of such a dimension which precludes safe access to survey the walls and floor, spoil material will be surveyed in the excavator bucket and/or at the surface adjacent to the excavation. If elevated gamma radiation measurements are noted within the fill, equal to or exceeding twice the background gamma count, the excavation will proceed in thinner lifts, 6 to 12 inches. If the excavated fill exceeds the Applicable Cleanup Standard, the radiologically-impacted fill will be placed directly in a super-sack or at a minimum staged on plastic separate from the clean soil until it can be containerized. Appropriate PPE will be required if radiologically-impacted fill soil is present and the excavation will be treated as an exclusion zone until this impacted fill is removed from the excavation and the area is released by the USEPA. Radiologically-impacted fill will be loaded into a super-sack and staged at the Site temporary until transportation for proper disposal is arranged. The ground surface under the staged pile will also be surveyed to confirm no contamination remains following removal of the staged material.

It should be noted that projects previously conducted in Streeterville utilized Tronox for the transportation and disposal of the radiologically-impacted soil. In January 2009 Tronox filed for Chapter 11 Bankruptcy which will complicate disposal arrangements and potentially make temporary storage of radiologically-impacted soil a necessity. In order to efficiently utilize the available storage space, it will be important to limit the disposal of materials to only that which exceeds the Applicable Cleanup Standard. In addition to the described Ludlum screening methods, the sampling of potentially-impacted soil in a manner similar to that used for verification sampling may be useful to identify whether material is truly above the Applicable Cleanup Standard.

Excavation equipment that has contacted radiologically-impacted fill will be surveyed with a Ludlum Model 3 Pancake Probe for elevated radioactivity. Indications of elevated radioactivity will require decontamination in accordance with the Work Plan SOP 347, Decontamination. All equipment in contact with the radiologically-impacted fill will be documented as clean through a swipe survey and alpha radiation count using the Ludlum Model 2200 and Model 43-10 Alpha counter, in accordance with the Work Plan SOP 345, Survey for Surface Contamination and Release of Equipment for Unrestricted Use.

3.3 Excavation of Radiologically-impacted Soil

The project activities will also include the removal of the radiologically-impacted soil above the Applicable Cleanup Standard if such soil is identified. The radiologically-impacted fill/soil that is discovered will be

removed to levels below the Applicable Cleanup Standard where practicable. In some cases this may mean that radiologically-impacted material may remain at on-site. The locations of any impacted material that will remain will be discussed with the USEPA prior to any backfilling activities.

These excavation areas will be designated Exclusion Zones for purposes of health and safety requirements until such time as the impacted soil identified above the Applicable Cleanup Standard is removed from the excavation areas, loaded into transport boxes and or super-sacks, and the areas are released by the USEPA. The excavation process will utilize a small excavator or backhoe with a maximum bucket volume of less than one cubic yard. This bucket size will facilitate loading of super sacks without spilling and/or spreading the contamination. When possible, the impacted fill soil will be loaded directly into super-sacks. The shipping container (super-sack) exteriors will be confirmed clean prior to leaving the Site in accordance with SOP-320 (Appendix D). It is anticipated that it will be necessary to temporarily store radiologically-impacted fill soil in super-sacks on the property until final disposal arrangements can be completed. Stored soil will be properly secured with fencing and placarded with appropriate warning signs (i.e., similar to that utilized for Exclusion Zones).

If concrete (floor) slabs within the historical fill are to be excavated, the slabs will be broken and removed and the soil beneath the slabs screened for verification. Concrete slabs, footings or walls encountered and excavated during the excavation activities will be cleaned of adhering contamination, if any, and will either be removed from the Site or stockpiled on-site for subsequent use or disposal in connection with Site development work.

The excavation of radiologically-impacted fill above the Applicable Cleanup Standard will be confirmed by surveys conducted during the excavation process. Once the confirmation survey has confirmed the absence of soil impacted at levels above the Applicable Cleanup Standard (SOP-210) within the Work Area, the excavation will be subject to verification survey and sampling by USEPA, in accordance with Section 4.2.3 of this Work Plan (SOP-223 and SOP-214 of Appendix D).

4.0 METHODS

4.1 Applicable Cleanup Standard

The USEPA has set the cleanup level as 5 pCi/g total radium (Ra-226 and Ra-228) above the background. A level of 2.1 pCi/g total radium is currently considered background for the area by the USEPA. Thus, radiologically-impacted material is defined by the USEPA for the Streeterville area as exceeding a threshold of 7.1 (pCi/g) total radium.

Field measurements will be taken of gamma radiation levels using a Ludlum 2221 rater-scaler and a 2 x 2 NaI detector. The equipment will be calibrated to determine the gamma count in cpm that is equivalent to 7.1 pCi/g. Equipment calibration will be performed at least annually using the thorium calibration blocks at the former Tronox West Chicago Rare Earth Facility.

Field measurements of gamma counts will include the following surveys of non-native fill material:

- Surveys of excavation as overburden is removed;
- Surveys of excavation as radiologically-impacted soil is removed;
- Surveys of excavations to document all impacted soil has been removed; and
- Surveys of utility or foundation excavations.

4.2 Surficial Walk-over and Grading Surveys

Surficial survey methods will be used in the initial phase of this project to identify the potential presence of radiologically-impacted materials within the first 18 inches of the Site. This same technique will be used for grading and/or excavation screening within the excavation areas to survey for the presence of radiological impacts above the Applicable Cleanup Standard. A grid with 5-meter spacing will be marked by stakes and flagging at the edges of the Work Area or by paint on the ground surface within the Site. The areas between the grid points will be scanned so as to cover 100 percent of the intra-grid areas.

The surveys will be conducted using a Ludlum 2221 rater-scaler and a 2 x 2 NaI gamma detector. The detector will be unshielded to provide for a broader screening area in assessing the surface survey. Values will be recorded in counts per minute (cpm). The maximum value will be recorded for each grid cell and all anomalously high areas (two times the background concentration) will have the approximate limits designated on the survey data sheets. The locations will be marked in paint on the ground surface. Field screening data sheets will include recording the instrument serial number, calibration date, operator, and site grid coordinates surveyed. A copy of a field data sheet is attached (see Appendix C).

Areas that are identified as exceeding the Applicable Cleanup Standard will be designated as Exclusion Zones until the time as such impacted soil above the Applicable Cleanup Standard has been removed from the Exclusion Zone, loaded into a super-sack and the area released by the USEPA. Work activities within the Exclusion Zones will be conducted in accordance with the procedures outlined in the HASP and briefly summarized in Section 5.0.

Additional documentation of contaminant levels may be performed through the collection of samples for laboratory analysis using NUTRANL and/or high resolution gamma spectroscopy analyses. These samples may be collected to: a) document where removal is necessary; b) indicate areas where removal has been successful; or c) document areas that are below the USEPA threshold level as indicated by the NaI detector. In limited cases samples may also be collected to document what will be left in-place.

4.3 Confirmation Surveys for Radiologically-Impacted Areas

Radiological screening surveys will be conducted during the remedial excavation of fill materials identified as radiologically-impacted above the Applicable Cleanup Standard. Excavated locations will be screened in accordance with SOP-210 (Appendix D). If radiologically-impacted soil in excess of the Applicable Cleanup Standard is identified, these areas will be designated as Exclusion Zones until the time as such impacted soil above the Applicable Cleanup Standard has been removed from the Exclusion Zone, loaded into a transport box and the area released by the USEPA. As described in the Health and Safety Plan (HASP) and discussed briefly in Section 5.0, the Exclusion Zones will require appropriate PPE and personal air monitoring to enter. All equipment and personnel that enter an Exclusion Zone will be frisked clean upon leaving the Exclusion Zone. Personnel entering Exclusion Zones must be 40-hour health and safety trained. The surveys will be conducted using a Ludlum 2221 rater-scaler and a 2 x 2 NaI gamma detector. Soil impacted above the Applicable Cleanup Standard will be excavated where practicable.

Excavation within Exclusion Zones will proceed in lifts not to exceed 18 inches in thickness and soil/fill will be surveyed in-place where practical. Excavation may proceed in thinner lifts to minimize the potential for mixing clean and radiologically-impacted soil. Excavation of impacted material will proceed using a small excavator or backhoe with a maximum bucket volume of less than one cubic yard. This bucket size will facilitate loading the super-sacks without spilling and spreading the radiologically-impacted soil contamination.

Soil screening during the course of the remedial excavation activities within the Work Area is also intended to minimize the incorporation of clean material into contaminated materials which are designated for offsite disposal. Soil indicative of levels below the Applicable Cleanup Standard by the screening process prior to excavation will be staged for potential use as backfill. As previously indicated, excavation conducted to remove radiologically-impacted material will proceed using a small excavator or backhoe with a maximum bucket volume of less than one cubic yard. This bucket size will also allow the excavated soil to be screened a second time before being placed on the backfill pile. This potentially non-impacted soil will also be subject to verification surveys in accordance with SOP-214 (Appendix D).

If the soil screening after remediation indicates the absence of radiologically-impacted material above the cleanup threshold, soil/fill samples will be collected over a maximum 100 m^2 area for confirmation/pre-verification analysis. Each confirmation/pre-verification sample will be a composite sample made up of five subsamples collected from an area not to exceed 100 m^2. The confirmation/pre-verification sample will be a composite sample made up of five subsamples obtained by dividing the 100 m^2 area (10-meter x 10-meter) into four equal quadrants of 5-meters x 5-meters. Four of the subsamples will be collected from the center of the 5-meter x 5-meter quadrants. The fifth subsample will be obtained from the center of the 10-meter x 10-meter sample area. Sample collection will be in accordance with SOP-214. For confirmation/pre-verification, the five subsamples will be composited and a analyzed as a single sample.

It is anticipated that NUTRANL software will be the primary sample analysis method and will be conducted at an off-site (fixed) laboratory. NUTRANL samples will be collected and analyzed by Stan Huber and Associates. After confirmation analysis shows the area to be clean, the area will be subject to a verification survey and sampling by USEPA. The excavations will not be backfilled until a signed radiological verification closure form is received from USEPA.

Prior to the initiation of activities, gamma count rate background levels shall be established for each applicable survey instrument. Six locations shall be chosen in non-radiologically-impacted areas of the Site. A one-minute integrated count shall be obtained at the surface of each location for each survey instrument (Ludlum 2221 with 2" x 2" NaI probe). The measurements collected from each location shall be averaged to establish instrument specific background gamma count rates.

4.4 Verification Sampling

As previously indicated, the excavation screening within the Work Area is not intended, but may include the screening of historical fill down to native soil. Excavated fill soil identified as exhibiting contamination at concentrations above the Applicable Cleanup Standard of 7.1 pCi/g total radium (Ra-226 + Ra 228) will be removed, placed in super-sacks and temporary stored on-site while awaiting shipment to an offsite disposal site. Excavated locations will be screened in accordance with SOP-210 (Appendix D). For remediated areas, initial field demonstration that the location has been excavated to clean limits will be made with a shielded 2 x 2 NaI detector. This will be followed by the collection of a confirmation/pre-verification sample in accordance with SOP-223 (Appendix D). This sample will be analyzed using NUTRANL software or gamma spectroscopy analyses. If the confirmation analysis shows the area to be clean, the area will be subject to a verification survey and sampling by USEPA.

The verification survey sampling program will be conducted by the USEPA in a manner essentially identical to that performed for the confirmation sampling. Specifically, the verification sample results will be made up of five subsamples obtained by dividing the 100 m^2 area (10-meter x 10-meter) into four equal quadrants of 5-meters x 5-meters. Four of the subsamples will be collected from the center of the 5-meter x 5-meter quadrants, while the fifth subsample will be obtained from the center of the 10-meter x 10-meter sample area. The five verification samples will be composited, homogenized and, if analyzed using NUTRANL, split back into five individual subsamples for analysis. The results of the five subsamples will be averaged for each 100 m^2 verification area. This differs slightly from the confirmation/pre-verification subsamples, which were composited and analyzed as a single sample. The verification sample will be collected and prepare in general accordance with SOP-223 and SOP-214 (Appendix D) and analyzed using NUTRANL software. The Exclusion Zones will not be backfilled until a signed radiological verification closure form is received from USEPA or USEPA has agreed that the material may remain in-place.

NUTRANL results would be provided in two forms. The initial NUTRANL data set will consist of one set per sample and will include the radionuclide concentrations and error limits for uranium 238, thorium 232, radium 226, and potassium 40; the sample number; date and time sampled; laboratory number (sequential); identify the analyst; and analytic method (NUTRANL). The second field lab data form will be a consolidated spreadsheet with all analysis in sequence by laboratory number. This table will include the sample number, data and time sampled, radionuclide concentrations and error limits for the four NUTRANL analytes, and a line totaling the thorium and radium concentrations. In addition, QA/QC samples including daily blanks (empty vial), a daily standard approximately equal to the Applicable Cleanup Standard, periodic duplicates and a set of USEPA laboratory QC check standards using NIST traceable sources will be analyzed to establish the reliability and accuracy of the NUTRANL results.

High resolution gamma spectroscopy analyses may also be sent to a subcontract laboratory operated by RSSI. The laboratory data package will include available chain-of-custody copies, sample receipt and tracking forms, preparation and analysis logbooks, raw data forms, tabulated data summaries, calibration records, and standards, QC sample results, and any corrective action reports (refer to SOP-364 in Appendix D). Gamma spec analysis will be conducted using a Library Energy Tolerance of 1.2 keV and a Gamma Fraction Limit of 71%.

4.5 Materials Management

Material from the Site that is not radiologically-impacted at levels above the Applicable Cleanup Standard may be replaced in their original locations, placed in another location on the Site, salvaged, or handled in accordance with applicable laws and regulations. Materials that are not radiologically-impacted, and are designated to be removed from the Site, will be disposed of in accordance with applicable regulations as necessary.

Material that is impacted above the Applicable Cleanup Standard will be sent to an approved disposal facility. These materials may be temporarily stored on-site pursuant with USEPA approval. Projects previously

conducted in Streeterville have involved Tronox in the transportation and disposal of the radiologically-impacted soil. In January 2009 Tronox filed for Chapter 11 Bankruptcy. At present the shipping and disposal of impacted materials is undetermined, but are likely to be either EnergySolutions of Clive Utah or US Ecology in Idaho. It is generally anticipated that the radiologically-impacted material will be sent to EnergySolutions Clive Facility, with the assumption that the disposal costs are competitive with alternate disposal sites. Shipping and placarding will be in accordance with all Department of Transportation regulations for shipping radiologically-impacted material. Permitting for disposal will be arranged before impacted material is loaded for long distance shipment.

Radiologically-impacted materials will be transported between the Site and the approved disposal facility according to DOT regulations. Procedures which will be used to minimize the potential for and effects of spills and accidents during transport of materials radiologically-impacted above the Applicable Cleanup Standard include, but are not limited to, the following:

- Drivers will have the proper licenses, training, and certifications for transporting potentially radioactive materials.
- Trucks transporting low-level radioactive materials in excess of 7.1 pCi/g total radium will have sealed or lined containment. In addition, covers for the roll-off containers or flatbed trailers will be placed over the load prior to exiting the Site. Trucks will carry all necessary papers and placarding. AECOM will inspect containers prior to loading to determine suitability.
- If necessary, any contaminated vehicles and equipment will be decontaminated first using broom cleaning to remove all adhering surface dirt. As needed, pressurized water spray will be used for further decontamination. Water generated during decontamination will be contained and evaporated, used for dust control on contaminated soils designated for disposal, or possibly sent for disposal at an approved disposal facility.
- Prior to transporting radiologically-impacted excavated soils or other materials, all transport equipment will be frisked. Frisking will include tires and fenders and the sides and back of the bed. Frisking the cabs of trucks will not be necessary unless loading has been over the front of the truck.

Two categories of historical fill material will be distinguished in the excavation process: radiologically-impacted fill/soil exceeding the cleanup threshold of 7.1 pCi/g total radium, and excavated soil suitable for backfill that is not radiologically-impacted in excess of 7.1 pCi/g total radium. There also may be materials that will be specified by the owner as unsuitable or suitable for backfill, based on engineering properties, non-radiological impacts, or other specifications. For this Work Plan, a distinction is proposed for radiologically-impacted materials above the Applicable Cleanup Standard and non-radiologically-impacted materials. Handling or disposal of non-radiologically-impacted materials at an off-site location will comply with all applicable laws and regulations.

No non-radiologically-impacted materials (i.e., petroleum, etc.) are known to be present at the Site. However, materials that, based on visual or olfactory observations, are suspected to be grossly impacted by non-radiological contamination may be temporarily staged on-site to allow for proper sampling and characterization for disposal. These materials will be placed on liners and will be covered to minimize potential for erosion and spread of contamination.

4.6 Data Management and Report

Data management for the Site consists of site safety and training records, health physics data (i.e., personnel monitoring data), soil radioactivity field and laboratory data, shipping and transport records, and civil construction and excavation data (i.e., land surveys, excavation volume estimates, etc.). A local laboratory will be used to analyze soil samples as excavation and removal proceeds, and for pre-verification sampling that the radiological cleanup criteria have been met. Analytical records will be kept at the AECOM office in Vernon

Hills, Illinois. Air monitoring analyses will be maintained at the AECOM office and will be transmitted with the monthly project progress reports to USEPA.

Monthly progress reports will be submitted to USEPA beginning 30 days after initiation of the field work and will be electronically submitted monthly by the 15th of each month until submission of the Closure Report document, unless otherwise directed by the USEPA On-Scene Coordinator (OSC). These reports will describe all significant developments during the preceding period, including the work performed, and any problems encountered, analytical data received during the reporting period, and developments anticipated during the next reporting period, including a schedule of work to be performed, anticipated problems, and planned resolutions.

4.7 Exclusion Zone Access and Security

Access by unauthorized personnel to the Exclusion Zone excavation areas will be controlled during operational and non operational hours because of hazards created by open excavations, moving contractors' equipment, and traffic. Only authorized personnel will be permitted within the fenced area. Exclusion Zone access will be directed by the Project Coordinator, Field Team Leader or their designated representative (see HASP). The excavation Work Area will be fenced with a temporary chain-link fence unless the access is restricted by fencing at the Site perimeter. In the case of a perimeter fence, access to the excavation areas will be restricted through the use of temporary fencing (i.e., plastic barrier fencing). This fencing will include appropriate signage to provide security during non operational hours. Access gates/points will be closed and locked when not in use.

During operational hours, the project management consultant, its contractors and subcontractors, and their representatives will have access to the excavation area to implement the excavation activities. The contractor responsible for radiological soil transport, and their contractors, will have access to implement health physics and transportation activities. Information on restrictions to the excavation areas, and various signs and barricades, will be disseminated during the project kick-off meeting held at the beginning of the project.

All visitors desiring access to the excavation area will be required to register with the Project Coordinator or his designee. The Project Coordinator or his designee will provide necessary orientation and training, provide radiation monitors as appropriate, and escort the visitors. The visitors will be required to observe all health and safety requirements and follow all instructions given by the Field Team Leader.

Regulatory and governmental officials who visit the excavation areas for regular or unscheduled visits will be requested to notify the Project Coordinator or the Field Team Leader. Visitors will be required to comply with all Health and Safety rules. US EPA personnel may make unscheduled visits to the Site following the above guidelines.

During non operational hours, barricades, warning signs, and temporary fencing, as appropriate, will be placed to prevent unauthorized entry into an Exclusion Zone. Exclusion Zones will be surrounded with magenta and yellow rope and stakes or fence posts until a determination that it meets the Applicable Cleanup Standard. Signs will be placed on the excavation area perimeter fencing identifying the area as a construction area and prohibiting unauthorized entry. The warning signs will be installed at maximum 100 foot intervals on the perimeter fence.

4.8 Decontamination

All discarded materials, waste materials, and other field equipment and supplies shall be handled in such a way to prevent the potential spread of contamination during excavation and restoration activities. Discarded items that have contacted contaminated materials will be containerized and stored for disposal at the approved disposal facility. Non-contaminated items to be discarded will be collected for disposal as general refuse waste. Personnel and sampling equipment decontamination are described in the Decontamination Procedure included as SOP-347 of Appendix D.

4.9 Temporary Storage of Radiologically-Impacted Material

As per discussions with the US EPA, there will be a need for the temporary on-site storage of radiologically-impacted materials. Projects previously conducted in Streeterville have involved Tronox in the transportation and disposal of the radiologically-impacted soil. In January 2009 Tronox filed for Chapter 11 Bankruptcy. The bankruptcy complicates disposal arrangements and makes temporary storage a necessity. Especially in the case of a small remediation effort, it is anticipated that radiologically-impacted soil will be staged temporary on-site in super-sacks until the remediation efforts are complete. Once the volume of impacted material is known, arrangements for the transport and proper disposal will be scheduled. Stored soil will be properly secured with fencing and placarded with appropriate warning signs (i.e., similar to that utilized for Exclusion Zones).

5.0 HEALTH AND SAFETY PLAN (HASP) SUMMARY

A project specific HASP is provided under separate cover. Site surveys, excavation and remediation activities will be conducted in accordance with the Site HASP. Additionally, reference is made to the following documents included within Appendices D, E and F:

- Dust Control Plan
- SOP-210 – Gamma Radiological Surveys
- SOP-217 – Excavation Procedure
- SOP-223 – Verification Survey Procedure
- Construction Health and Safety

The HASP addresses required training, personnel protection equipment, general work precautions, and medical monitoring among other issues. In general, as radiologically-impacted soil above the Applicable Cleanup Standard is detected, either by the initial surface survey or in the course of monitoring the excavations, the areas will be designated with a magenta and yellow rope and stakes or fence posts. These areas wil be designated Exclusion Zones, and will require appropriate PPE and personal air monitoring to enter. All equipment and personnel that enter an Exclusion Zone will need to be frisked clean upon leaving the Exclusion Zone. Personnel entering Exclusion Zones must be 40-hour health and safety trained.

All accidents or injury "near misses" will be documented and communicated to the Project Coordinator and Field Team Leader in a timely manner. Project safety briefings will be held on a weekly basis, and a project tailgate meeting will be held on a daily basis as a regular part of project communication between the Field Team Leader and project contractors and subcontractors.

5.1 Key Personnel

While health and safety will be the concern of every person on the job, the radiation survey and soil excavation management team will be responsible for the implementation of the HASP. These persons are the Project Coordinator, Health and Safety Officer/Coordinator and the Field Team Leader. Figure 2 presents the project management work organization chart. The responsibilities for these positions are detailed in the HASP. Radiation laboratory subcontract services will be provided through Stan A. Huber Consultants, Inc. (Huber).

5.2 Potential Hazards

Potential hazards that could be encountered during the removal activities include contact with contaminated materials and the hazards associated with construction work. Contaminants of concern include the entire decay series for U-238 and Th-232. Radiological and air monitoring as described in this Work Plan will be performed during excavation to define the presence of radiological contaminants.

The mechanisms for exposure to the radiologically-impacted soil material are direct exposure, inhalation, ingestion and eye/skin contact. The primary mechanism of exposure is direct exposure to external gamma radiation. All workers will be instructed in appropriate measures to protect against exposure to the above materials, and PPE will be worn until monitoring shows PPE is not necessary.

Physical hazards which might be encountered at this Site include but are not limited to the following:

- Construction equipment (front-end loaders, trak excavators, trucks, compactors, bulldozers);
- Power tools (saws, drills, jack hammers, compactors);

- Heat and cold stress;
- Overhead power lines;
- Excavations;
- Confined space;
- Noise;
- Demolition of structures;
- Slip, trip and fall conditions, especially during wet or freezing periods; and
- Buried utilities which may or may not be live.

For this project, "utilities" may include natural gas, water, sewer, communication, cable television lines, and electrical power distribution systems. Prior to the physical Site survey, city and utility company records concerning location and construction of utilities on and in the general vicinity will be reviewed and consolidated on a single Utility Plan Drawing. The appropriate utility companies or their designees will be asked to verify the location by originating a request through the Chicago Utility Alert Network (DIGGER) phone number: 312-744-7000, and through application to the Office of Underground Coordination (OUC).

The locations of the identified utilities will be "ground-truthed" by observing the locations of power and phone poles, above-ground transformers (where electrical distribution lines are below ground), manholes, water meters, natural gas meters, phone boxes, surface indications such as utility vaults, catch basins, and surface depressions which can occur over utility trenches, and the locations marked by the utility companies or their representatives. Procedures for working in the vicinity of utilities and repair to damaged utilities will be discussed with the excavation contractor crews. All work on and in the vicinity of utilities will be in accordance with City and utility company specifications.

Additional details on these and other safety provisions are addressed in the HASP.

5.3 Training and Communications

Site and project specific radiation and health and safety training will be provided for all on-site personnel prior to work on the Site. All personnel required to work in the Exclusion Zone or Contamination Reduction Zone shall complete training conforming to the requirements of 29 CFR 1910.120(e) including 40-hours of initial hazardous waste site worker training. Where appropriate, they shall have 8-hours of annual refresher training, and 8-hour supervisor training as appropriate. Field personnel shall complete radiation safety training in compliance with 32 IAC 400. This training shall include training pertaining to radiation safety and awareness. Training will be conducted by a qualified safety specialist and/or a qualified senior health physics technician, at a minimum. The project training program is included in the HASP. As noted in the HASP, Federal safety requirements take precedence over state requirements.

All site personnel will be trained and briefed on radiation basics, anticipated hazards, equipment to be worn, safety practices to be followed, contamination prevention practices, emergency procedures, radiation basics and communications. Procedures for leaving the Exclusion Zone shall be planned and implemented prior to going on-site. Work Areas and decontamination procedures will be established based on expected site conditions, and updated as necessary during construction. Other guidelines such as heat and cold stress, excavation safety and confined space are included within the HASP.

In addition to this formal health and safety training, "tailgate" safety meetings will be held daily, or more frequently, dependent on safety issues arising during the project. These meetings may be led by the field team leader or the worker's foremen and every employee must sign in before beginning work. The subject covered and persons present will be recorded for each meeting and kept as part of the project records. Health and safety incidents and monitoring results will be discussed in the tailgate safety meetings, when appropriate.

Visitors to the Site will be briefed on the requirements of the HASP before being allowed within the Work Area, and will be accompanied by a foreman or supervisor whenever possible.

5.4 Personal Protective Equipment

Disposable coveralls, steel-toed work shoes, boot covers, hard hat, safety glasses and gloves will also be required in all Exclusion Zones. Prior to exiting any Exclusion Zones, personnel will pass through decontamination, disposal of all appropriate PPE, and frisking procedures as described in the HASP. Personnel operating in Exclusion Zones will be required to have personal air monitors (PAMs).

5.5 Air Quality Monitoring

The principal objectives of the air monitoring activities are to:

- Ensure worker and general population safety and provide radiological control information;
- Evaluate work procedures and site control measures. In addition to identifying the need for corrective action, air monitoring also documents the effectiveness of such control actions; and
- Measure releases of airborne radioactivity (should any occur) and ensure that people living and working in the surrounding area are not exposed to radiation above acceptable limits.

A primary requirement of dust control is "no visible dust" during activities associated with contaminant removal. The excavation (remediation) and soil handling areas where impacted soil is present will be required to have no visible dust. Fugitive dust generation is caused by a range of activities including excavation, loading, dumping, transporting and scraping using heavy equipment such as bulldozers, front-end loaders, trucks and graders.

Air monitoring is generally conducted for the purpose of documenting and, if detected, initiating measures to control airborne contamination. High volume air sampling equipment has been used in the past for large scale remediation efforts in Streeterville and has not indicated an issue. Therefore, it is apparent that control measures are appropriate for controlling fugitive dust issues and high volume air sampling provides little or no benefit on this project. Relative to large scale remediation projects, the volume of impacted soil that will be excavated is minimal (measured in yards rather than hundreds of yard), and where previous efforts have involved the use of an excavator with a one cubic yard bucket, plans for this project will involve a small excavator/backhoe and 1 yard super-sacks. Thus, the potential opportunity to create a fugitive dust issue will be reduced significantly from that of the large scale project. As such, no high volume air sampling is proposed and air monitoring will only be conducted at a personnel level.

During the excavation and handling of radiologically-impacted materials, the procedures to be followed to control dust will include traffic speed control and use of covered stockpiles. Excavated radiologically-impacted soil above the Applicable Cleanup Standard will be loaded directly into the super sacks as the material is excavated. Radiologically-impacted material stored on-site will be stored in super-sacks. Stockpiled clean materials, including excavated and imported borrow material, will be piled to minimize dust generation. If these initial efforts appear to be inadequate to control dust, water will be applied during the course of excavation and restoration activities as directed by the Field Team Leader to prevent, mitigate or reduce dust resulting from excavation activities. The Dust Control Plan (Appendix E) provides additional detail on the control measures that may be implemented, if necessary, at the Site.

5.5.1 Personal Exposure Monitoring

Personnel operating in Exclusion Zones will be required to have personal air monitors (PAMs). Procedures for personal air monitoring are discussed in the HASP and SOP-212 (Appendix D). Lapel samplers worn for personal air monitoring will be utilized for airborne radioactivity monitoring. Air filters will be analyzed on a daily basis and additional evaluation of samples will be performed when determined necessary based on

elevated results. Procedural changes or control measures, such as wetting of soils, will be employed prior to the prescription of respiratory protective equipment.

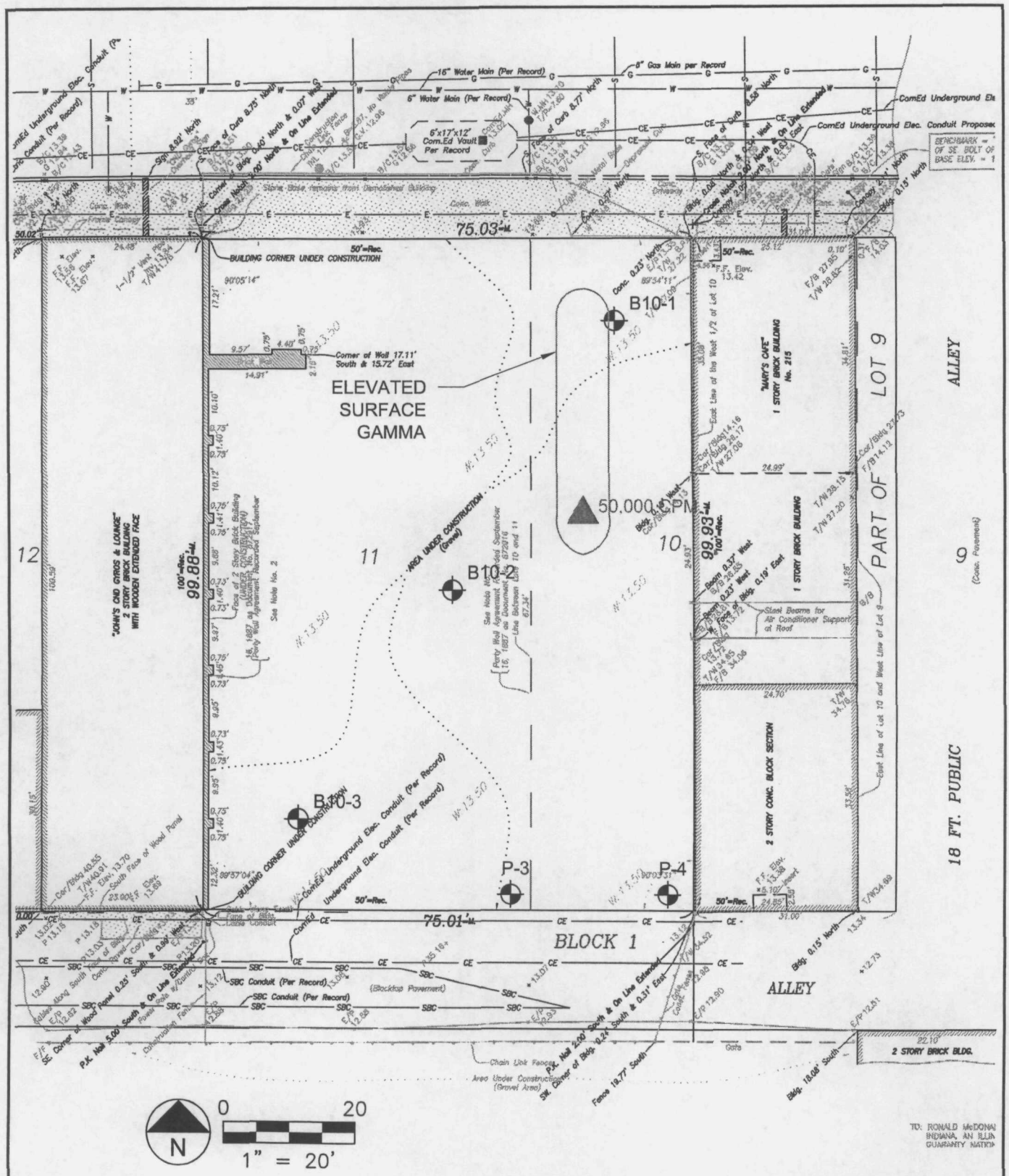
6.0 COMPLETION DOCUMENTATION

An objective of the Work Plan is to document the excavation screening activities, as well as the identification, handling, and disposal of radiologically-impacted soil encountered during the screening activities in selected areas of the Site. The following types of data will be generated during the project:

- Surface gamma survey records;
- Soil sampling records;
- Soil sample field laboratory data;
- Fixed laboratory soil analyses data (USEPA contract and AECOM subcontract laboratories);
- Air quality (personnel) sampling records; and
- Air quality (personnel) analytical data.

The results of the Work Plan investigation and the removal work will be presented in a final completion report. The report will provide a summary of unsurveyed areas, locations of radiologically-impacted material above the Applicable Cleanup Standard identified during the project as well as the areas remediated. The report will include field data, laboratory results, documentation of the volume of material removed and its disposal location. The report will present the information as the basis for and will request issuance by USEPA of a "Certification of Completion Letter" for the Site. The draft Completion Report will be submitted within 60 days of completion of the removal work and on-site investigations. AECOM will incorporate U.S. EPA's comments, if any, and submit the final report within 15 days of receiving U.S. EPA's written comments, if any, on the draft Completion Report.

FIGURES



TO: RONALD McDONALD HOUSE CHARITIES OF INDIANA, AN ILLINOIS CORPORATION; GUARANTY NATIONAL

X:\PROJECTS\60157402\000_CAD\001_DRAWINGS\SHEETS\G60157402_SBLD.dwg; 9/28/2010 4:13:25 PM; DEARMAN, DANIEL; STS.stb

AECOM

847.279.2500
www.aecom.com

SOIL BORING LOCATION DIAGRAM
PROPOSED RONALD MCDONALD HOUSE
RONALD MCDONALD HOUSE CHARITIES
211 E. GRAND AVENUE
CHICAGO, ILLINOIS

Drawn :	PCC	06/25/2010
Checked:	PCC	06/25/2010
Approved:	TAK	06/25/2010
PROJECT NUMBER	60157402	
FIGURE NUMBER	1	

PROJECT MANAGEMENT ORGANIZATION CHART

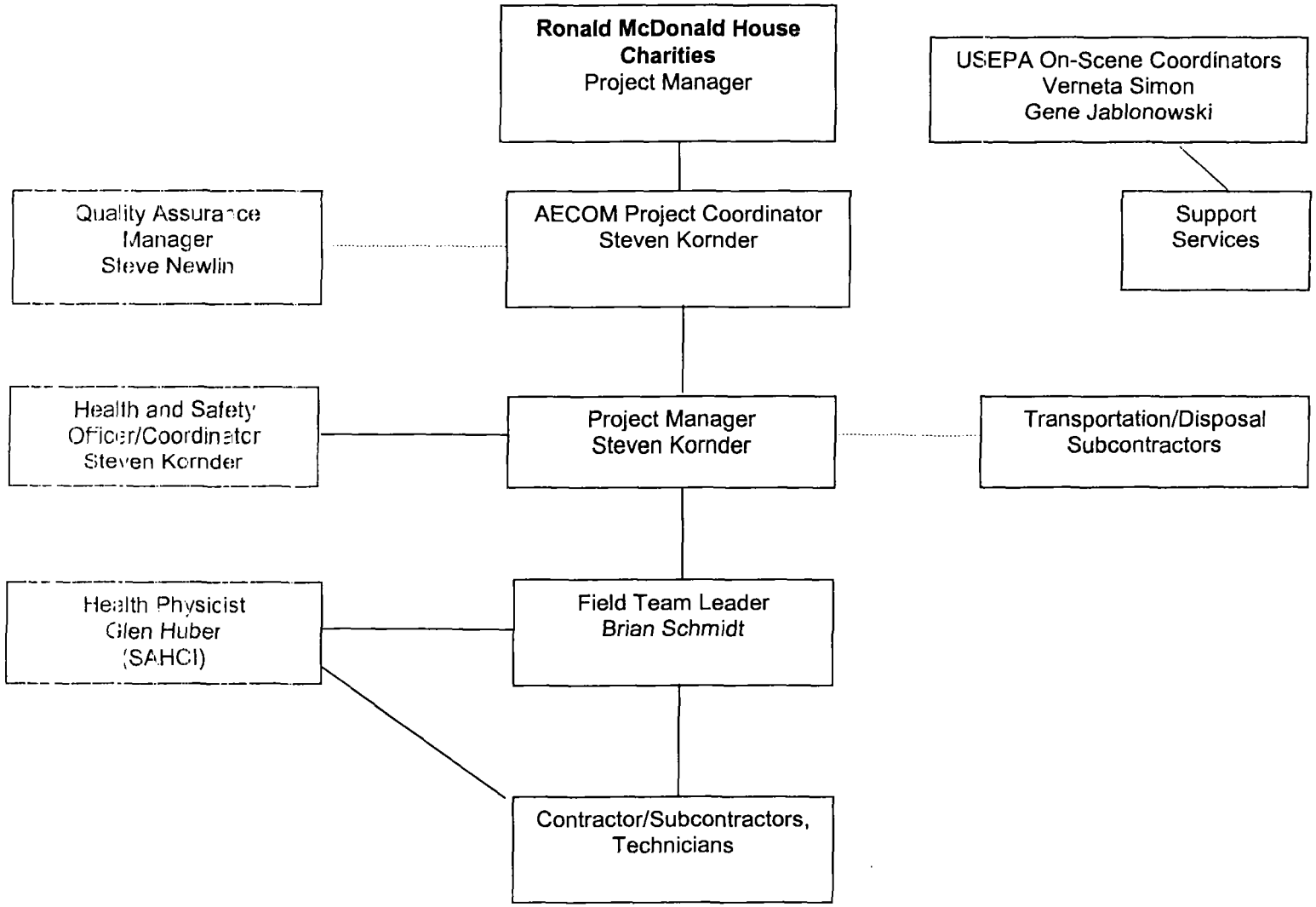


Figure 2

APPENDIX

Appendix A

AECOM Radiological Survey Results Report

Prepared for:
Ronald McDonald House Charities
Oak Brook, Illinois

Radiological Survey Results for

211 E. Grand Avenue

Chicago, Illinois

AECOM
750 Corporate Woods Pkwy
Vernon Hills, IL 60061

847-279-2500 tel
847-279-2510 fax

October 11, 2010

Mr. Doug Porter, CEO
Ronald McDonald House Charities of Chicagoland & Northwest Indiana
1900 Spring Road
Suite 310
Oak Brook, IL USA

Subject: Radiological Survey Results for 211 E. Grand Avenue in Chicago, Illinois, AECOM, Inc. Project No. 60157402

Dear Mr. Porter:

The enclosed report summarizes the findings of the radiological down-hole survey and surface radiological survey completed by AECOM at the above referenced property. Should you have any questions, please feel free to contact us at 847-279-2500.

Regards,

Jaclyn C. Webb
Assistant Project Engineer

Steve C. Kornder, Ph. D.
Senior Geochemist

Table of Contents

1.0 Introduction **1**

2.0 Radiological Screening Scope **1**

2.1 Site Background 1

2.2 Down-hole Project Scope 2

2.2.1 Instrument Calibration 2

2.2.2 Down-hole Survey Results 3

2.3 Test Pitting and Surface Screening 4

2.3.1 Radiological Surface Screening of the Former Loading Dock Driveway 4

2.4 Radiological Screening in the Alley 5

3.0 Conclusions **5**

List of Tables

Table 1 – Down-hole Gamma Results

List of Figures

Figure 1 – Down-hole Gamma Readings

Figure 2 – Down-hole Gamma Histogram

List of Appendices

Appendix A Plat of Survey Drawing

Appendix B USEPA Letter of November 16, 2009

Appendix C Boring Location Drawing

1.0 Introduction

The property, 211 E Grand Avenue (Site) is located in an area of reclaimed land where fill material was placed along the Lake Michigan shoreline starting in the 1860's. This area of Chicago is commonly referred to as Streeterville. Recent developments in the Streeterville area of Chicago encountered radiologically-impacted soil/fill. The radiologically-impacted fill material was originally generated as a byproduct from a former gas mantle production that used thorium nitrate in its manufacturing process. The manufacturing operations were located at 316 East Illinois Street and 161 E. Grand Street in Chicago, Illinois. These manufacturing operations were conducted from the early 1900s through the early 1930s. The radiological impacts consist of elevated concentrations of thorium in the near surface fill soils in the vicinity of the former Lindsay Light site. Due to the proximity of this property to the manufacturing site and documented cleanups at other properties in the Streeterville area, screening for thorium-impacted fill soil is warranted where invasive work is planned. Furthermore, the U. S. Environmental Protection Agency (USEPA), which has oversight authority for radiologically-impacted sites, requests that radiological surveys be completed prior to and during site development.

2.0 Radiological Screening Scope

2.1 Site Background

The Site is approximately 75-feet wide and 100-feet deep. It is bounded by East Grand Avenue on the north, a public alley on the south and brick and/or concrete block buildings immediately adjacent to the eastern and western property lines (refer to Appendix A). Prior to the recent demolition activities completed in April 2010, the Site was occupied by a four story commercial brick building with a full basement. The building was situated in a north-south orientation and abutted the southern, northern and western property lines, and was approximately 52-feet wide by 100-feet. This structure was likely built in 1887 according to the Phase I completed in March of 2008 by Gabriel Environmental Services. As such, the building was built approximately 15 years prior to the founding of the Lindsay Light Company in Streeterville. Therefore, the presence of Lindsay Light thorium material below the basement floor and building footings would not be anticipated.

Additionally, a two story brick building occupied the southeast corner of the Site. This structure was approximately 24-feet wide and 40-feet deep and abutted the alley to the south as well as the eastern property line. This structure reportedly did not have a basement. North of this two story building was a paved loading dock driveway approximately 24-feet wide and 60-feet deep that was accessed from East Grand Ave. Thus, the eastern one-third of the Site, which measures 24 feet by 100 feet, appears to have been previously unexcavated.

On November 11, 2009 the USEPA conducted a walk-over radiation survey of the Site including the loading dock area and basement, which included four test pits that had been installed to obtain structural information. Results from the survey were summarized in correspondence from the USEPA dated November 16, 2009 (Appendix B). According to the USEPA, the results did not indicate the potential presence of radiologically-impacted fill materials in either the alley or the basement. In a letter date April 28, 2010, the USEPA indicated that based on the survey results and age of the building, that it was unlikely that subsurface thorium contamination would be present. In the same letter the USEPA also reiterated a request to perform radiological monitoring of the planned geotechnical borings and indicated a concern that contamination may

be present off-site below the asphalt in the alley to the south. USEPA indicated that radiation monitoring must be conducted if activities will disturb the alley subsurface (i.e., foundation construction, utilities, etc.).

2.2 Down-hole Project Scope

The down-hole radiological scope included the screening of three (3) geotechnical borings and four (4) shallow (about 5-foot deep) borings south of the Site within the public alley. Two of the three geotechnical borings (SB-10-2 and SB-10-3) were located within in the boundary of the former basement, which had been filled with debris (brick and concrete) from the demolition of the building. The primary purpose of the borings in the alley was to determine if radiologically-impacted fill soil was present per the request of the USEPA.

In July 2010, the three geotechnical borings were installed, but the borings in the alley could not be completed due to the presence of underground utilities. Two of the borings (P3 and P4) were moved north and completed just inside the property line. However, the other two borings were not completed since the primarily intent was to assess fill soil presence in the alley and moving them to the edge of the alley would limit their ability the assess alley fill material. Thus, down-hole radiological surveys were completed at five of the borings to evaluate the potential presence of radiological materials. Table 1 presents the down-hole radiological screening results. A drawing showing the location of the borings is included in Appendix C.

2.2.1 Instrument Calibration

The equipment used for the down-hole radiation screening included Ludlum 2221 Rate Meter-Scaler and a Ludlum 44-10 2-inch x 2-inch Sodium-Iodide (NaI) Probe with a 1-inch thick lead end cap. The equipment calibration was performed on November 9, 2009 under the direction of Glenn Huber (Certified Health Physicist) of Stan A Huber, Inc. (Huber). The down-hole probe and instrument configuration was field calibrated in August 2009. The Ludlum 44-10 2-inch x 2-inch NaI Probe and the Ludlum 2221 Rate Meter-Scaler were calibrated in drums at the Tronox West Chicago Rare Earths Facility using a configuration similar to that anticipated in the field (i.e., 3-inch PVC pipe). The down-hole instrument field calibration was performed to obtain a cutoff threshold value equivalent to the USEPA cleanup limit of 7.1 pCi/g total radium. The results of the instrument and down-hole field calibration are summarized in the table below.

Ludlum 2221 Serial #	Probe PR 44-10 Serial #	Count Equivalent to 7.1 pCi/gm Total Radium		
		Surface – Unshielded (1 min. count)	Surface – Shielded (1 min. count)	Down-hole Shielded* (30 sec. count)
173944	098198	17,522	6,052	12,479

Notes: * - 1" lead end cap used as shield for down-hole calibrations.

The threshold value of 12,479 counts/30-seconds equivalent to the USEPA cleanup limit of 7.1 pCi/g total radium was determined by using the linear relationship of the data obtained from the drums. Three 30-second count results were obtained at each drum. The average of these values was plotted against the known pCi/g value of each drum. An equation was developed from the linear regression trendline along with an R^2 value. The R^2 value illustrates how well the linear regression line approximates the data points. An R^2 of 1.0 indicates a perfect fit. The trend line resulted in an R^2 of 0.9998, which indicates a near perfect fit for the data obtained during calibration.

To determine the instrument threshold equivalent to the USEPA cleanup level, the linear regression equation for the data with the 1-inch lead end-cap shielded probe was used. This end-cap shielded probe configuration was utilized for the down-hole measurements since the 1-inch end-cap maximizes the lateral sensitivity of the probe. The units of the x and y variables in the equation are pCi/g and counts per 30-seconds, respectively. The slope of the equation represents the change in instrument response to the change in total radium concentration, while the y-intercept (i.e., 3,628 counts/30-seconds) represents the effects of other sources of

background radiation on the probe. The sources and amount of background radiation may vary with specific site conditions.

The USEPA cleanup threshold in Streeterville for radiological impacts is 7.1 pCi/g total radium (5 pCi/g above the USEPA background value of 2.1 pCi/g total radium set for Streeterville). Since background radiation from sources other than radium may vary from site to site, AECOM generally utilizes the most conservative approach and omits the addition of the y-intercept (i.e., value of 3,628 counts/30-seconds). Therefore, the value of 7.1 pCi/g is multiplied by the slope of the equation and results in an instrument cleanup threshold value of 12,479 counts/30-seconds. This creates a conservative approach in attempting to identify radiological anomalies during the down-hole surveys.

It should be noted that AECOM believes that that a conservative approach is warranted for down-hole screening activities because the volume of material being screened is small compared to surface and/or lift screening activities that generally screen 100% of the exposed surface. Generally, because of the shielding effects of soil, the NaI probe surveys only about a 1½ foot radius around the borehole. When evaluating down-hole data it has also been our experience that anomalous results, which do not exceed the field instrumentation threshold, may indicate the potential presence of radiologically-impacted material outside of the immediate vicinity of the boring. Anomalous results are generally regarded as gamma readings that are appreciably greater than the preceding or successive measurements. While these reading may not exceed the field instrumentation cutoff threshold, the anomalous readings generally appear as or cause a bimodal distribution when the individual results are plotted on a histogram.

2.2.2 Down-hole Survey Results

The down-hole radiation surveys for the five soil borings were conducted between August 24 and September 3, 2009. All borings were drilled with a nominal 4.25-inch diameter hollow stem auger. A 3-inch diameter Schecule 40 PVC casing was installed in each hole, and gamma readings were taken in 6-inch increments extending to the native soil. The gamma logging was conducted with a Ludlum 2221 rater-scaler and a 2 x 2 NaI probe. The probe was equipped with a 1-inch thick lead end cap at the lower end of the probe to maximize the lateral sensitivity of the probe and minimize the influence of deeper material on the gamma readings

Surface screening of the spoil generated and the down-hole monitoring revealed no indication of soils above the specified clean-up threshold established by the USEPA for the Streeterville area of Chicago. Table 1 presents a summary of the down-hole gamma readings observed for each boring during the survey. AECOM personnel were responsible for the survey results collected during geotechnical drilling. The gamma count potentially indicative of the 7.1 pCi/g USEPA threshold is 12,479 counts/30-seconds shielded with a 1-inch lead end cap. Survey results ranged from a minimum of 1,805 counts/30-seconds to a maximum of 15,379 counts/30-seconds. Figure 1 displays the results of each boring as well as the USEPA threshold. Figure 2 is a histogram of the survey results and displays essentially a bell-shaped distribution centered at about 3,000 counts/30-seconds with only a couple anomalous outliers.

From review of Table 1, it is apparent that the results of the two borings (SB-10-2 and SB-10-3) completed within the demolition debris were well below the USEPA cleanup threshold as were the results at the base of the former basement slab. Specifically, the down-hole gamma results for the former basement area ranged from 2,167 to 3,742 counts/30-seconds. As previously indicated, the presence of Lindsay Light thorium material below the basement floor and/or building footings would not be anticipated since the building was built approximately 15 years prior to the founding of the Lindsay Light Company in Streeterville.

The only anomalous readings observed were at boring SB-10-1. Readings between 1.5 to 3.5 feet were slightly elevated and the reading observed at 2.5-feet (15,379 counts/30-seconds) exceeded the instrumentation threshold value of 12,479 counts/30-seconds based on the USEPA cleanup value of 7.1 pCi/g total radium. SB-10-1 is located in former loading dock driveway in the eastern one-third of the Site which

does not appear to have been previously excavated. Additional investigation was performed, specifically the excavation of a sallow test pit in the vicinity of the elevated gamma readings.

2.3 Test Pitting and Surface Screening

The SB-10-1 boring is located in a former drive way and/or loading dock area (refer to Appendix C), which was not included within the building footprint. Thus, there is a potential for fill materials to be present in this area. Since there was only one measurement that was slightly over the USEPA threshold, there was a possibility that the meter was reading natural radioactivity present in brick and/or granite paver materials. As such, a plan to visually examine the materials contributing to the elevated gamma reading was coordinated with a testing pitting effort to observe the foundations of the adjacent structures on September 16, 2010.

The excavation of the test pits was performed using a bobcat. The radiological test pit was located in the vicinity of boring SB-10-1. The pit was located about 10-15 feet south of the East Grand Avenue sidewalk. Initial surface measurements indicated gamma reading that ranged from 14,000 to 16,000 counts per minute (cpm), which is below the unshielded Ludlum threshold value of 17,522 cpm that is equivalent to the USEPA cleanup value of 7.1 pCi/g total radium. As excavation proceeded, the gamma reading increased to about 17,000 cpm at a depth of about 2-feet, but did not exceed the USEPA cleanup threshold. Excavation continued in this area until a depth of about 2.5-feet with gamma reading typically in the 15,000 to 17,000 cpm range.

The higher readings appeared to be occurring toward the southern edge of the test pit. Therefore, the test pit was extended approximately 10-feet farther south. In this southern section of the test pit the readings ranged from 19,000 to 21,000 cpm at a depth of about 18-inches. However, fill material removed from the test pit remained below the USEPA cleanup threshold. The fill soil in the test pit at the base of the excavation, where elevated readings were observed, consisted of tan to black colored sand to gravel size material with cinders, ash and some brick/concrete debris. No pavers or appreciable brick material was present. When it was apparent that material above the USEPA cleanup threshold was present, excavation activities were halted to avoid the excavation of impacted material and the test pit was backfilled.

Two geotechnical test pits along the eastern property boundary were completed to observe the foundations of the buildings for foundation design purposes. The first test pit (geotech #1) was dug approximately 35-feet south of the East Grand Avenue sidewalk. The maximum depth was approximately 4-feet. Gamma readings for the test pit ranged from 11,000 to 14,000 cpm. A maximum of 16,000 cpm was observed just below the surface on the western edge of the test pit approximately 10-feet from the eastern property boundary. No gamma readings were observed above the instrument threshold of 17,522 cpm. The second test pit (geotech #2) was located approximately 65-feet south of the sidewalk with a maximum depth of about 4-feet. Gamma readings for the test pit ranged from 11,000 to 13,500 cpm and a maximum of about 14,300 cpm. No indication of radiologically-impacted fill was present.

2.3.1 Radiological Surface Screening of the Former Loading Dock Driveway

After back filling of the boring test pit, a radiological surface survey of the remainder of the former drive was performed. It is estimated that the former drive was about 24-feet wide and extended south about 60-feet from the sidewalk on East Grand Avenue. Surface screening completed on September 16, 2010 indicated an area of elevated readings is present along the western edge of the drive near the former building foundation. The first ten feet south of the side walk had gamma readings that ranged from 10,100 to 13,000 cpm with a maximum of 15,500 cpm (versus a Ludlum threshold value of 17,522 cpm). Excluding the western edge of the drive, gamma readings in the remainder of the drive (next 50-feet) generally ranged from 13,500 cpm to 16,500 cpm. The lowest readings were generally along the eastern property boundary.

The highest gamma reading occurred toward the western edge of the former drive. The surface reading in the western section ranged from 15,400 to 20,700 cpm with a maximum of 52,000 cpm about 41 feet south of the sidewalk and 17 feet west of the eastern property boundary. Hand excavation of a small area to a depth of about 1-foot at the highest surface reading indicated a maximum of 106,000 cpm versus the instrument

threshold of 17,522 cpm. A sample of the material at this depth was retained for future potential analysis. Although readings at the surface were slightly elevated, it appeared the surface material in the western portion of the drive may not be above the cleanup threshold and that the instrument may be measuring elevated/impacted material below the surface. This would be consistent with the readings recorded at boring SB-10-1.

In summary, an area just below the current surface (about 6 by 40 feet and parallel to the former building foundation) on the western side of the former loading dock driveway exhibits slightly elevated surface gamma readings that appear indicative of soil and/or fill impacted with Lindsay Light thorium material. The approximate extent of the elevated surface gamma readings is shown on the boring log location drawing in Appendix C. Visual examination in the area of the elevated gamma measurements indicated that the readings were inconsistent with natural materials such as brick and/or granite pavers. Based on the limited amount of delineation conducted, it does not appear that the radiologically-impacted material is more than a couple of feet in thickness, but additional investigation would be necessary to quantify the extent and volume of material.

2.4 Radiological Screening in the Alley

A surface survey of the northern half of the alley was completed on September 16, 2010. The alley south of the site is currently asphalt paved. The down-hole survey within the alley could not be surveyed because of buried ut lities. Three surface screening passes each approximately a meter wide were conducted in order to cover the northern half of the alley immediately adjacent to the site. The surface gamma readings typically ranged from 7,200 to 9,600 cpm. The maximum value observed was 11,500 cpm versus the instrument threshold of 17,522 cpm base on the USEPA cleanup limit of 7.1 pCi/g total radium. The maximum reading occurred at the centerline of the alley approximately 10-feet west of a line projected along the eastern property boundary. In any case, no indications of elevated gamma readings were observed. However, shielding due to the presence of pavement limits the depth of this surface screening.

3.0 Conclusions

Three geotechnical and two shallow exploratory borings were completed to evaluate the potential for radiological impacts during the geotechnical subsurface assessment. Soil boring SB-10-1 indicates that the historical fill at the Site has a thickness of about 7-8 feet, at which point native lake sands were encountered. The water table appears to be located at approximately 12 feet below ground surface. Down-hole radiological surveys were conducted in two 5-foot borings just within the southern property boundary and three geotechnical borings to a depth of about 7-8 feet or approximately the start of the native sand.

Down-hole radiological surveying of the two geotechnical boring located within the footprint of the building with the full basement did not indicate the presence of radiologically-impacted fill material. This data is consistent with USEPA's conclusion that radiologically-impacted material is unlikely to be present beneath the structure given that the building predates the Lindsay Light Company.

The remaining geotechnical boring (SB-10-1) was located in the eastern one-third of the Site in an area that appears to have been previously unexcavated. This unexcavated area measures 24 feet by 100 feet and was occupied by loading dock driveway and 2-story brick building without a basement. With one exception the gamma results at boring SB-10-1 were below the instrument threshold of 12,479 counts/30-seconds, which is equivalent to the USEPA cleanup value of 7.1 pCi/g. This maximum value of 15,379 counts/30-seconds cpm was observed at a depth of 2.5 feet. As a result, the area was further investigated via a test pit.

The test pit excavated for radiological screening near boring SB-10-1 located in the former drive area suggests that an area just below the current surface exhibits elevated gamma readings. The readings observed appear

indicative of fill soil impacted with Lindsay Light thorium material and visual examination in the area of the elevated gamma measurements indicated that the readings were inconsistent with natural materials such as brick and/or granite pavers.

Surface gamma measurements indicate the size of the area with elevated readings is about 6 by 40 feet and that is confined to the area of east of the former four story building. The area is east of the former building foundation on the western side of the former loading dock driveway. Based on the limited amount of delineation conducted, it appears that the radiologically-impacted material is likely a couple of feet in thickness, but additional investigation would be necessary to quantify the extent and volume of material above the USEPA cleanup threshold.

Radiological screening at two geotechnical test pits excavated along the eastern property boundary in the former drive did not indicate gamma readings above the USEPA cleanup threshold. Thus, the surface gamma readings in the former loading dock drive and the information from the geotechnical test pits suggests that radiologically-impacted fill soil is not present along the eastern property boundary.

Finally a radiological surface survey of the alley did not observe elevated gamma readings. However, shielding due to the presence of pavement limits the depth of this surface screening.

NATIONAL SURVEY SERVICE, INC.

ALTA/ACSM LAND TITLE SURVEY

SURVEY NO. N-127941 STAKE & TOPO. DATE: DEC. 11, 2008

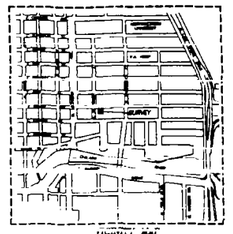
Plat of Survey

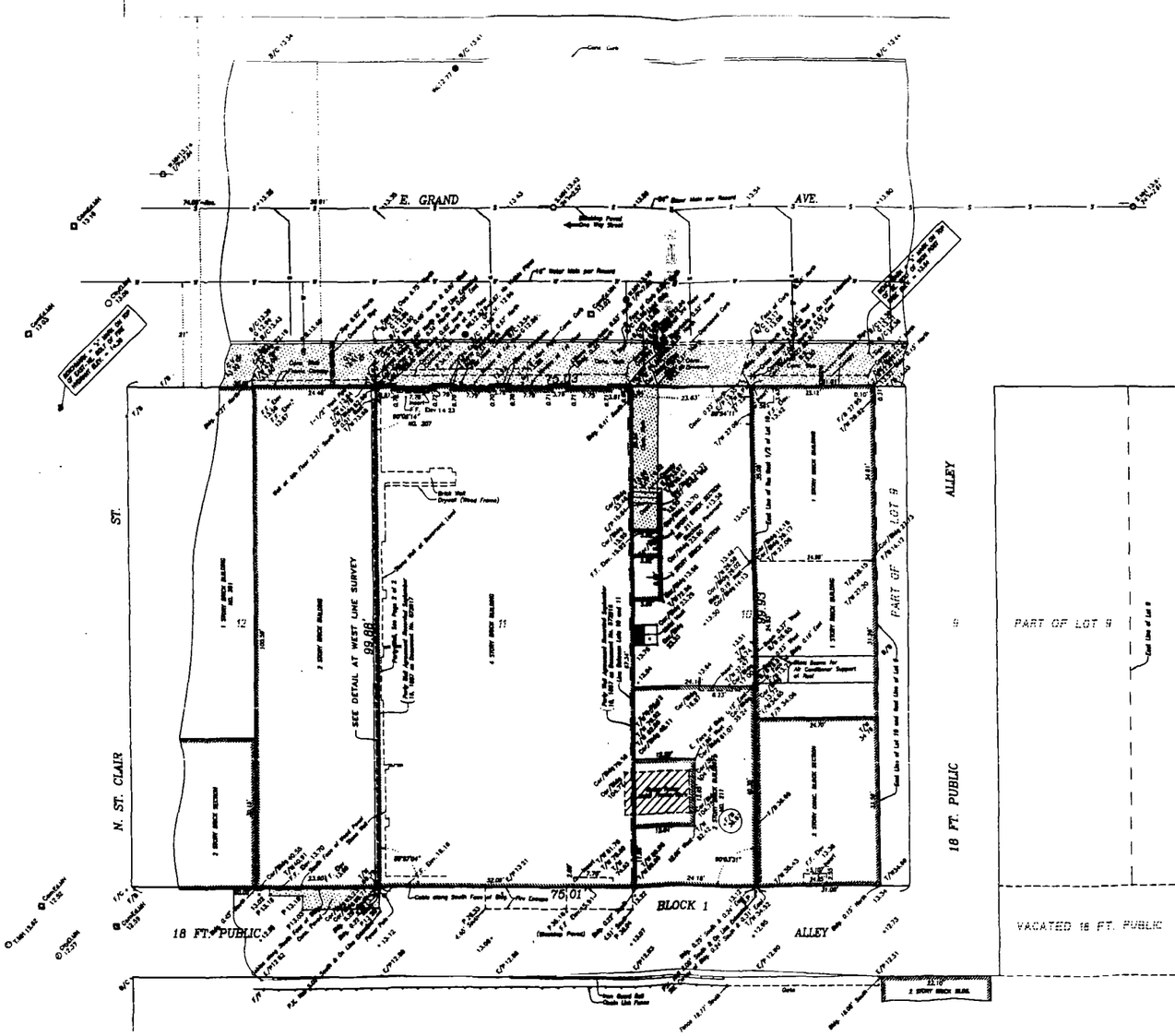
LOT 11 AND THE WEST HALF OF LOT 10 IN THE SUBDIVISION OF BLOCK 1 OF JOHNSTON SUBDIVISION OF BLOCK 18 IN GRACE ADDITION TO CHICAGO, A SUBDIVISION OF THE NORTH FRACTION OF SECTION 10, TOWNSHIP 39 NORTH, RANGE 14 EAST OF THE THIRD PRINCIPAL MERIDIAN, IN COOK COUNTY, ILLINOIS.

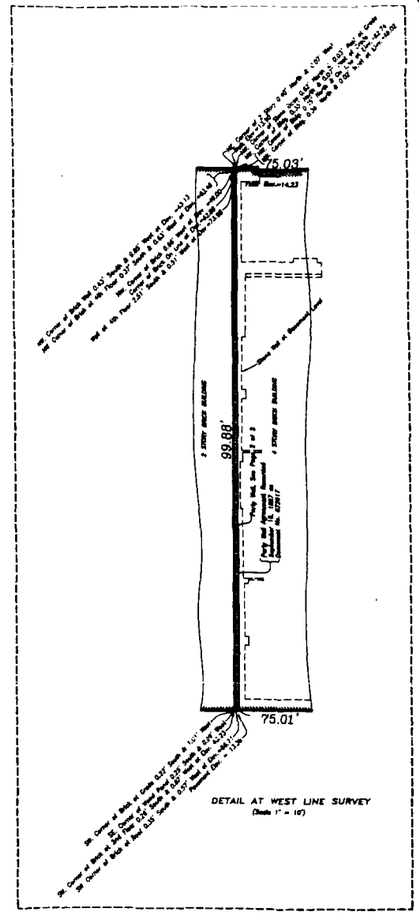
AREA = 7,466 SQ. FT. OR 0.1721 ACRES

KNOWN AS: 211 E. GRAND AVENUE, CHICAGO, ILLINOIS.

SURVEY FOR: Ames-ING







FOR ADDITIONAL DETAILS OF UTILITIES, CONTACT:

CHICAGO DEPARTMENT OF TRANSPORTATION
BUREAU OF INSPECTIONS
OFFICE OF UNDERGROUND COORDINATION
30 N. LASALLE ST., SUITE 1101
CHICAGO, IL 60602-2570
ATTN: MR. ERIC SINGLETON

LEGEND

B = BOTTOM OF MANHOLE	INL. = INLET
B.B. = BUFFALO BOX	L.P. = LIGHT POLE
B/C = BACK OF CURB	M.B. = MAIL BOX
B.P. = BUMPER POST	MH = MANHOLE
C = CORNER OF CURB	M.W. = MONITORING WELL
C.BX = CONTROL BOX	P = PAVEMENT
CM/ELBX = CITY ELECTRIC MANHOLE	P.M. = PARKING METER
CL = CENTER LINE	S.BOX = SWITCH BOX
CM/E&MH = COMM/ EDISON MANHOLE	S.P. = STANDPIPE
C.P. = CONCRETE PAD	S.San = SEWER MANHOLE
DF = DEBRIS FILLED	T.MH. = TELEPHONE MANHOLE
E/M = EDGE OF MEDIAN	T/D = TOP OF DOME
E/P = EDGE OF PAVEMENT	T/FND = TOP OF FOUNDATION
EL. = ELEVATION	T/P = TOP OF PIPE
F/B = FACE OF BUILDING	T/W = TOP OF WALL
F/C = FACE OF CURB	TELE.P. = TELEPHONE PEDESTAL
F/F = FACE OF FENCE	TRANS. = TRANSFORMER
F/W = FACE OF WALL	TS = TEST STATION
FL = FLAGLOT	T.S. =TRAFFIC SIGNAL
FF = FINISHED FLOOR	T.SIG. MH. =TRAFFIC SIGNAL MANHOLE
F.H. = FIRE HYDRANT	U.P. = UTILITY POLE
G = GUTTER	U.T.O. = UNABLE TO OPEN
G.MH. = GAS MANHOLE	VLT = VAULT
G.V. = GAS VALVE	W = WALK
G.R. = GUARD RAIL	W.MH. = WATER MANHOLE
I = INVERT OF PIPE	WF = WATER FILLED

CITY OF CHICAGO UNDERGROUND CITY ELECTRIC CONDUIT =

COMCAST CABLE TV CABLES =

UNDERGROUND TUNNEL =

CHICAGO TRANSIT AUTHORITY =

COMMONWEALTH EDISON CO UNDERGROUND ELECTRIC CONDUIT =

GAS MAIN =

SBC UNDERGROUND TELEPHONE CONDUIT =

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO =

OVERHEAD WIRES =

SEWER MAIN =

WATER MAIN =

WESTERN UNION UNDERGROUND CONDUIT =

IMPORTANT

NO DIMENSIONS SHOULD BE ASSUMED BY SCALE MEASUREMENTS UPON THIS PLAT.

DISTANCES ARE MARKED IN FEET AND DECIMAL PARTS THEREOF. THUS: 4.37' MEANS 4 FEET AND $\frac{37}{100}$ FEET; OR IN FEET AND INCHES. THUS: 4'-6 $\frac{1}{2}$".

CONSTRUCTIONS AND BUILDERS SHOULD BE NOTIFIED TO CAREFULLY TEST AND DETERMINE BY THE GROUND THE POINTS, MEASUREMENTS, ETC. AS NOTED ON THIS PLAT, WITH THE STAKES, POINTS, ETC. GIVEN ON THIS PROPERTY BEFORE BUILDING OR PLACING FOOTINGS, AND AT ONCE REPORT ANY SEEMING OR APPARENT DISCREPANCY. NO RESPONSIBILITY WILL BE ASSUMED FOR ANY DISCREPANCY OR INACCURACY OF DIMENSIONS OR POINTS MAY BE CORRECTED BEFORE DAMAGE IS DONE.

UTILITY DATA: NOT ALL THEM PHYSICAL EVIDENCE VISIBLE ON THE GROUND IS SHOWN. DO NOT LOCATIONS OBTAINED FROM PRIVATE AND PUBLIC SOURCES AS INDICATED AND SHOULD BE ASSUMED TO BE APPROXIMATE.

WARNING

UTILITY INFORMATION IS BASED UPON FIELD MEASUREMENTS, AND THE BEST AVAILABLE RECORDS. FIELD DATA IS LIMITED TO THAT WHICH IS VISIBLE AND CAN BE MEASURED. SAID BASED ARE: PERMANENT AND CHRONOLOGY OF UNDER UNDERGROUND UTILITIES. RECORD REPRESENTATION IS BASED UPON DATA COLLECTED FROM BOTH PUBLIC AND PRIVATE SOURCES. THE COMPLETENESS AND/OR ACCURACY OF THESE RECORDS CANNOT BE GUARANTEED, EXCEPT INSOFAR AS THEY CAN BE VERIFIED BY FIELD MEASUREMENT. PRIOR TO ANY EXCAVATION CONTACT "J.U.L.I.E." AT 312-744-7000, CHICAGO UTILITY ALERT NETWORK.

GRAPHIC SCALE

(IN FEET)
1 inch = 10 ft.

BENCHMARK NOTE:
ELEVATIONS ARE SHOWN IN RELATION TO CITY OF CHICAGO STANDARD BENCHMARK NO. 4388, ELEV. = 13.880 C.C.D. (CHICAGO CITY DATUM)

MARK CUT ON BOTTOM STEP AT EAST SIDE ON ENTRANCE OF NORTH SIDE OF 7 STORY BRICK BUILDING, MARK IS 20.85 FT. WEST OF THE NORTHEAST CORNER OF BUILDING AT SOUTHWEST CORNER OF N. FAIRBANKS CT. AND E. ONE ST.

ZONING: THE SUBJECT PROPERTY IS ZONED DX-12-DOWNTOWN MIXED USE

FLOOD HAZARD INFORMATION:

THE SUBJECT PROPERTY IS DESIGNATED AS ZONE "X" DEFINED AS AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN, AS SHOWN ON THE FLOOD INSURANCE RATE MAP (FIRM) FOR THE CITY OF CHICAGO, ILLINOIS, COMMUNITY NO. 170074, PANEL NUMBER 0438 MAP NUMBERS 17031C0438J MAP REVISED AUGUST 19, 2008, AS PUBLISHED BY THE FEDERAL EMERGENCY MANAGEMENT AGENCY.

TO:

THIS IS TO CERTIFY THAT THIS MAP OR PLAT AND THE SURVEY ON WHICH IT IS BASED WERE MADE IN ACCORDANCE WITH THE "MINIMUM STANDARD DETAIL REQUIREMENTS FOR ALTA/ACSM LAND TITLE SURVEYS," JOINTLY ESTABLISHED AND ADOPTED BY ALTA AND NSPS IN 2005, AND INCLUDES ITEMS 1, 2, 3, 4, 6 (CORNING DISTINCTION ONLY), 7A, 7B,1, 7C, 8, 9, 10, 11, 13, AND 14 OF TABLE A THEREOF. PURSUANT TO THE ACCURACY STANDARDS AS ADOPTED BY ALTA AND NSPS AND IN EFFECT ON THE DATE OF THIS CERTIFICATION. UNDERSIGNED FURTHER CERTIFIES THAT IN MY PROFESSIONAL OPINION, AS A LAND SURVEYOR REGISTERED IN THE STATE OF ILLINOIS, THE RELATIVE POSITIONAL ACCURACY OF THIS SURVEY DOES NOT EXCEED THAT WHICH IS SPECIFIED THEREIN.

COMMITMENT NUMBER:

EFFECTIVE DATE:

DATE: DECEMBER 11, 2008

BY:
ILLINOIS PROFESSIONAL LAND SURVEYOR NO. 3080

JOSEPH A. LIMA
3080
PROFESSIONAL LAND SURVEYOR
STATE OF ILLINOIS
CHICAGO, IL

MY LICENSE EXPIRES 11/30/2010

SURVEY NO. N-127941 STAKE & TOPO. DATE: DEC. 11, 2008

State of Illinois } ss.
County of Cook }

I, Joseph A. Lima, Certify that we have surveyed the above described property in accordance with official records and that the above plat is a true representation of said survey. Dimensions are corrected to a temperature of 62° Fahrenheit. This professional service conforms to the current Illinois minimum standards for a boundary survey.

NATIONAL SURVEY SERVICE, INC.
PROFESSIONAL LAND SURVEYORS
30 S. MICHIGAN AVENUE, SUITE 200
CHICAGO, ILLINOIS 60603
TEL: 312-630-9480 FAX: 312-630-9484

BY: _____
ILLINOIS PROFESSIONAL LAND SURVEYOR NO. 3080

K.P.

LAND PROJECTS 2008\N127941\7941-SUR.DWG CD-19

Tables

Table 1:
211 East Grand Avenue
Down-hole Gamma Results
July 2010
USEPA Threshold of 12,479 Counts per 30-seconds

Depth (ft)	Boring Location						
	SB-10-1	SB-10-2	SB-10-3	P-1	P-2	P-3	P-4
0.0	2794	2167	2183	Boring not installed due to utilities	Boring not installed due to utilities	2005	1805
0.5	4855	2743	2565			2630	2140
1.5	7295	2913	2700			3042	2297
2.0	11684	2884	2897			3026	2552
2.5	15379	2890	2832			3037	2485
3.0	11109	3014	2794			2891	2978
3.5	5677	3168	2739			2855	3367
4.0	4003	3319	2803			2831	3618
4.5	2752	3548	2667				
5.0	2151	3487	2546				
5.5	1835	3442	2608				
6.0	2452	3488	2653				
6.5	2951	3632	2610				
7.0	2491	3742	2609				
7.5	2197	3735	2444				
8.0	1987						
8.5	1975						
Native Sand	7	8	10				
Water Table	14.5	12.5	10				
Minimum	1835	2167	2183			2005	1805
Maximum	15379	3742	2897			3042	3618
Average	4917	3211	2643			2790	2655

Figures

Figure 1
Down-hole Gamma Readings
211 East Grand Avenue

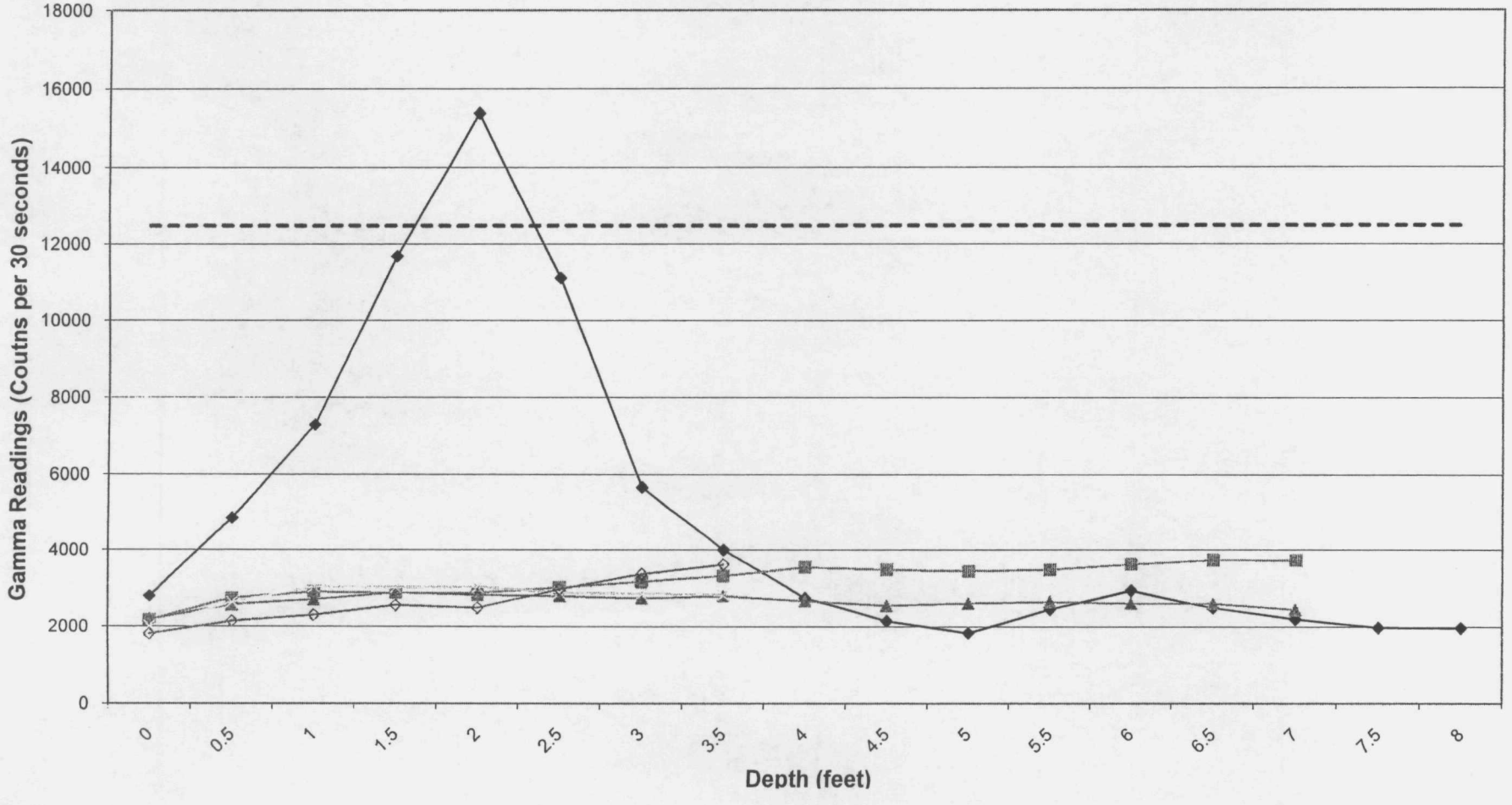
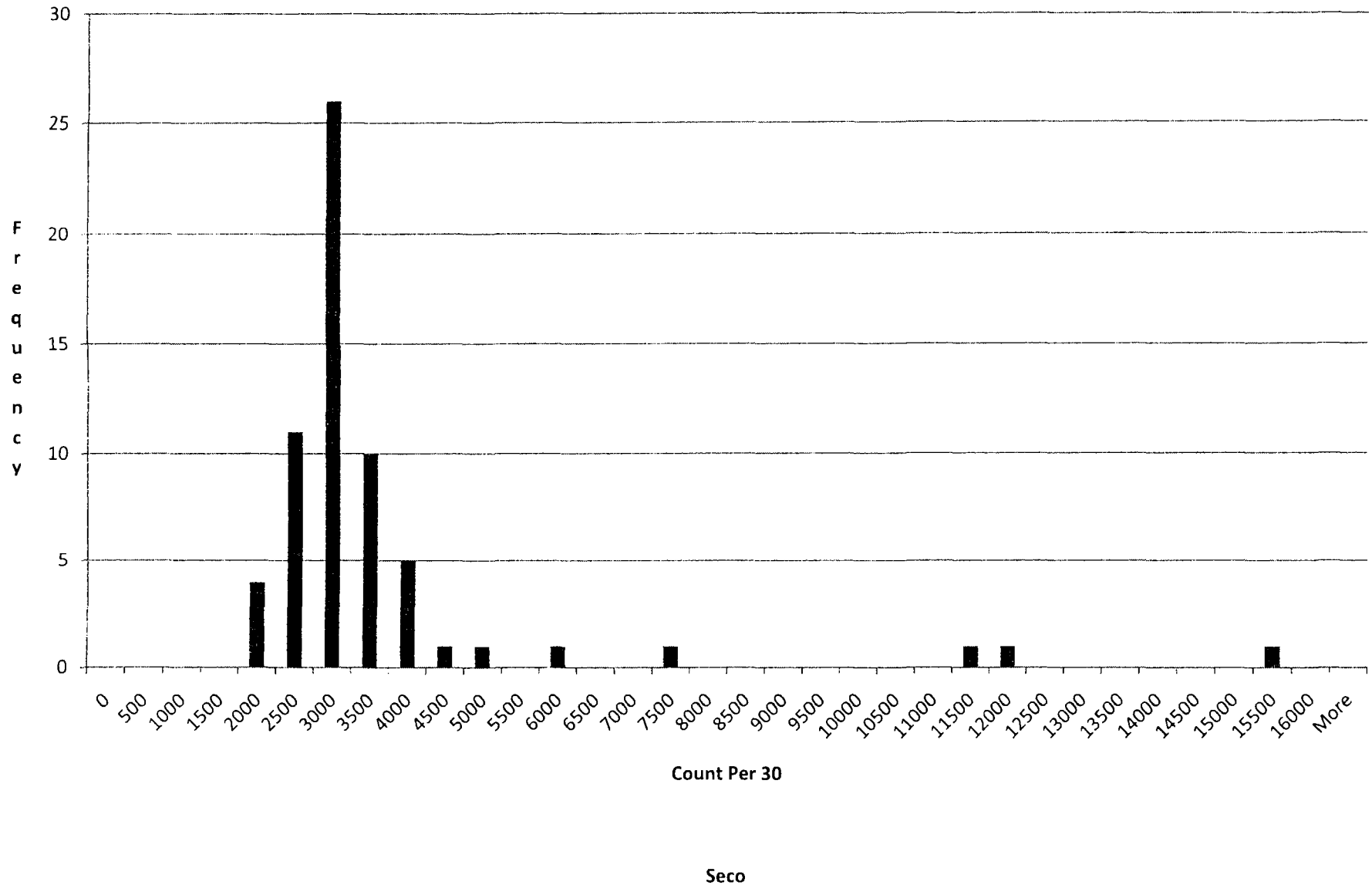


Figure 2
Down-hole Radiological Survey Histogram - 211 E. Grand Ave.
(12,479 Counts Per 30 Seconds equivalent to USEPA Cleanup Limit of 7.1 pCi/g Total Radium)



Appendix A

Plat of Survey Drawing

Appendix B

USEPA Letter of November 16, 2009

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

REPLY TO THE ATTENTION OF

NOV 16 2009

SE-5J

VIA ELECTRONIC MAIL (LSKIBA@DACCORDGROUP.COM)

Mr. Len Skiba
DACCORD Group, LLC
309 West Washington, Suite 405
Chicago, Illinois 60606

RE: Future Ronald McDonald House, 207/209/211 East Grand, Chicago, Illinois

Dear Mr. Skiba:

Thank you for your cooperation and your consent to allow the U.S. Environmental Protection Agency access to the property at 211 East Grand Avenue in Chicago, Illinois. On Monday, November 11, 2009, Eugene Jablonowski, U.S. EPA Superfund Health Physicist, and I conducted a radiation survey in the basement of the four story brick building with the entry door address of 207 East Grand and the first floor of the two-story brick building that is to the east of the building with the outside address of 211 East Grand. We also checked the four test pits that had been dug by hand in the basement for foundation information. U.S. EPA used a Ludlum 2 x 2 sodium iodide detector that had been calibrated to the Streeterville clean-up criterion of 7.1 picoCuries per gram which equated to approximately 18,000 counts per minute (cpm). The results were unremarkable. The gamma counts generally ranged from 5,000 to 6,000 cpm. One area investigated read as high as 13,000 cpm. In our opinion, your building does not appear to be impacted by the Lindsay Light thorium contamination. Please send us your demolition schedule since we would like to take additional readings when the concrete floor is removed from the basement and survey the soils under the two story building.

Thank you again for your continued cooperation. If you have any questions, please contact me at (312) 886-3601 or Eugene Jablonowski, Health Physicist, at (312) 886-4591. Please direct legal questions to Cathleen Martwick, Associate Regional Counsel, at (312) 886-7166 or to Mary Fulghum, Associate Regional Counsel, at (312) 886-4683.

Sincerely,

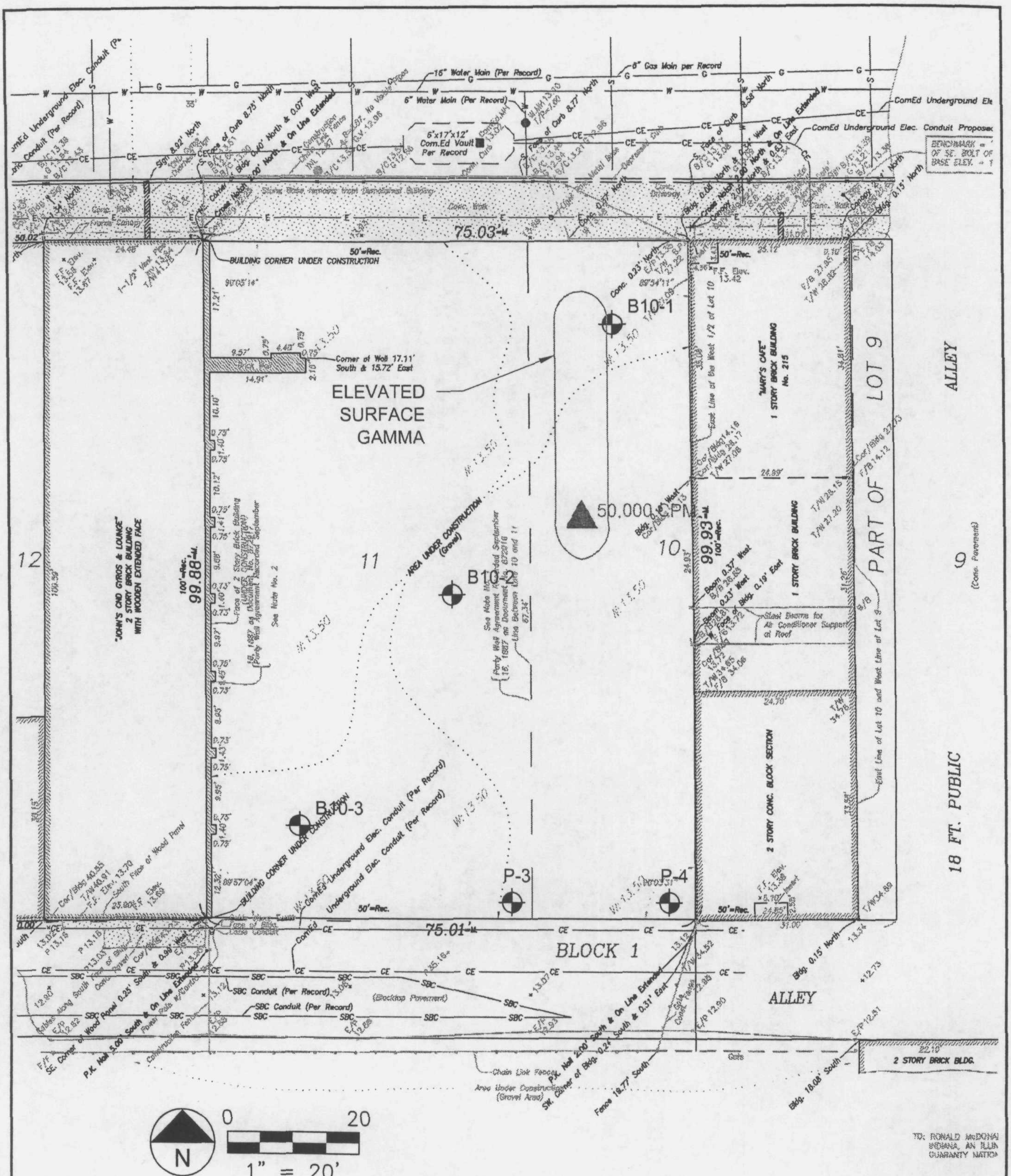
Verneta Simon

Verneta Simon
On-Scene Coordinator

cc: Eamon Reilly, Chicago Department of Environment
Paul Zalmezak, Chicago Department of Planning and Development

Appendix C

Boring Location Drawing



AECOM

847.279.2500
www.aecom.com

SOIL BORING LOCATION DIAGRAM
PROPOSED RONALD MCDONALD HOUSE
RONALD MCDONALD HOUSE CHARITIES
211 E. GRAND AVENUE
CHICAGO, ILLINOIS

Drawn:	PCC	06/25/2010
Checked:	PCC	06/25/2010
Approved:	TAK	06/25/2010
PROJECT NUMBER	60157402	
FIGURE NUMBER	1	

X:\PROJECT... 157402\000_CAD\001_DRAWINGS\SHEETS\60157402_SBLD.dwg: 9/28/2010 4:13:25 PM: DEARMAN, DANIEL

Appendix B

Gamma Spectroscopy Results – Sample Collected September 16, 2010

HIGH RESOLUTION GAMMA SPECTROSCOPY

RSSI ANALYSIS TOTAL RADIUM (pCI/g)

211 E GRAND AVENUE

RSSI Spectrum File No.	Report Date	AECOM Sample No.	Sample Date	Ra-226 (1)	Ra-228 (2)	Total Radium
G100130-An1	10-20-2010	60157402-1	9-16-10	4.45	39.5	44.0

(1) Pb-214 and Bi-214 measured as surrogates for Ra-226

(2) Ac-228 measured as surrogate for Ra-228

(3) ND = below minimum detected activity

RSSI Spectrum name: G100130.An1

Sample description
G100130 AECOM Streeterville sample ID 60157402-1

Spectrum Filename: H:\GammaVision\User\Spectra\G100130.An1

Acquisition information

Start time:	20-Oct-2010 09:52:27
Live time:	3600
Real time:	3652
Dead time:	1.42 %
Detector ID:	1

Detector system
USER-802B915354 MCB 9

Calibration

Filename:	G100130.Spc

10_10_06 energy calibration

Energy Calibration

Created:	20-Oct-2010 09:49:08
Zero offset:	-8.750 keV
Gain:	0.232 keV/channel
Quadratic:	3.423E-08 keV/channel^2

Efficiency Calibration

Created:	19-Aug-2010 11:00:19
Type:	Polynomial
Uncertainty:	1.354 %
Coefficients:	-0.387752 -4.534997 0.605475
	-0.074624 0.003505 -0.000074

Library Files

Main analysis library:	1001a.Lib
Library Match Width:	0.500
Peak stripping:	Library based

Analysis parameters

Analysis engine:	Npp32 G53W3.10
Start channel:	20 (-4.10keV)
Stop channel:	8144 (1885.90keV)
Peak rejection level:	100.000%
Peak search sensitivity:	3
Sample Size:	8.3300E+02
Activity scaling factor:	1.0000E+00/(1.0000E+00* 8.3300E+02) = 1.2005E-03
Detection limit method:	Traditional ORTEC method
Random error:	1.0000000E+00
Systematic error:	1.0000000E+00
Fraction Limit:	10.000%
Background width:	best method (based on spectrum).
Half lives decay limit:	12.000

RSSI Spectrum name: G100130.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	NO	
Decay during acquisition:	NO	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	10_09_13 48hr.Pbc 13-Sep-2010 15:29:09
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

Energy Calibration
Normalized diff: 0.0814

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Time of Count Activity uCi/g	Uncertainty Counting	1 Sigma Total
PB-214		4.5294E-06	2.230E+00%	3.865E+00%
PB-212		3.5628E-05	4.107E-01%	3.371E+00%
BI-212		3.6708E-05	2.847E+00%	3.660E+00%
AC-228		3.9481E-05	8.413E-01%	2.456E+00%
Tl-210	<	4.2515E-08		
TL-208		1.0881E-05	9.557E-01%	2.529E+00%
K-40		9.2889E-06	6.796E+00%	7.157E+00%
BI-214		4.3682E-06	3.543E+00%	4.234E+00%

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

S U M M A R Y

Total Activity (-4.1 to 1885.9 keV) 1.409E-04 uCi/g

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity uCi/g	Peak Energy keV	Activity uCi/g	Code	MDA Value uCi/g	COMMENTS
PB-214	N	4.5294E-06					
			351.93	4.466E-06	(P	7.823E-08 2.97E+00	G
			295.22	4.651E-06	(P	1.322E-07 3.27E+00	G
							Energy duplication
			77.11	4.529E-06	} P	1.016E-06 5.27E+00	XA
			241.99	5.528E-06	+ P	6.296E-07 1.10E+01	G
							Energy duplication
			74.82	4.044E-06	} P	1.492E-06 3.64E+01	XA

5 of 5 peaks found

Nuclide		Ave activity	Energy	Activity	Code	MDA	Comments
PB-212	N	3.5628E-05					
			238.63	3.563E-05	(P	6.319E-08	4.10E-01 G
							Energy duplication
			77.11	3.067E-05 }	P	4.302E-07	1.34E+00 XA
							Energy duplication
			74.82	3.563E-05 }	P	1.013E-06	2.10E+00 XA
			300.09	3.355E-05 -	P	1.031E-06	2.65E+00 G
			4 of 4 peaks found				
BI-212	N	3.6708E-05					
			727.33	3.651E-05	(P	4.688E-07	2.84E+00 G
			1620.50	5.332E-05 +	P	3.470E-06	8.49E+00 G
			785.37	3.793E-05	(P	2.608E-06	1.05E+01 G
			893.41	5.379E-05 +	P	8.323E-06	2.17E+01 G
			4 of 4 peaks found				
AC-228	N	3.9481E-05					
			911.20	3.948E-05	(P	9.032E-08	8.40E-01 G
			968.97	3.967E-05	(P	1.383E-07	1.11E+00 G
			338.32	3.262E-05 -	P	4.924E-07	2.70E+00 G
			964.77	3.891E-05	(P	7.250E-07	2.64E+00 G
			463.00	3.145E-05 -	P	9.380E-07	3.09E+00 G
			5 of 5 peaks found				
TL-208	N	1.0881E-05					
			583.19	1.089E-05	(P	3.970E-08	9.53E-01 G
			510.77	1.215E-05 +	P	2.558E-07	2.52E+00 G
			860.58	1.322E-05 +	P	4.497E-07	4.03E+00 G
			277.37	1.081E-05 @	(P	4.138E-07	6.66E+00 G
			763.13	1.358E-05 +	P	1.946E-06	1.32E+01 G
			5 of 5 peaks found				
K-40	N	9.2889E-06					
			1460.82	9.289E-06	(P	3.415E-07	5.72E+00 G
			1 of 1 peaks found				
BI-214	N	4.3682E-06					
			609.32	4.376E-06	(P	7.409E-08	3.50E+00 G
			1764.49	6.290E-06 +	P	3.803E-07	7.54E+00 G
			1120.29	5.089E-06 +	P	3.085E-07	7.67E+00 G
			1238.12	3.495E-06 -	P	5.926E-07	2.39E+01 G
			768.36	4.299E-06	(P	6.466E-07	1.54E+01 G
			5 of 5 peaks found				

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.

& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 1 Sigma%	FWHM keV		Suspected Nuclide
206.07	39.14	5581.	3285.	0.913	4.74	1.301	-	sM
400.77	84.39	14747.	2612.	0.725	6.86	1.562	-	D
413.00	87.23	16181.	7515.	2.087	2.66	1.564	-	D
425.05	90.03	16945.	5480.	1.522	3.62	1.565	-	D
439.48	93.38	12858.	5779.	1.605	3.07	1.567	-	D
465.20	99.35	15424.	1793.	0.498	14.47	1.309	-	
491.15	105.38	13596.	2047.	0.569	12.50	1.240	-	
522.45	112.69	12184.	360.	0.100	43.71	1.577	-	D
533.75	115.32	11246.	1248.	0.347	12.35	1.578	-	D
592.84	129.02	16141.	3347.	0.930	7.01	1.312	-	s
700.96	154.14	15738.	1528.	0.424	18.84	1.309	-	
837.77	185.94	11560.	1432.	0.398	18.96	1.133	-	s
896.02	199.48	10041.	568.	0.158	33.25	1.003	-	s
938.51	209.36	11090.	5450.	1.514	4.39	1.291	-	s
967.20	216.03	10599.	537.	0.149	38.00	0.880	-	s
1041.36	233.21	9575.	491.	0.137	28.51	1.642	-	D
1072.75	240.56	11661.	603.	0.168	25.63	1.646	-	D
1075.16	241.07	55044.	5079.	1.411	6.68	1.646	-	D
1124.76	252.65	6268.	512.	0.142	34.25	0.769	-	s
1200.74	270.31	7519.	4394.	1.221	4.61	1.337	-	
1277.71	288.20	4867.	589.	0.164	21.90	0.821	-	s
1418.61	320.95	4097.	662.	0.184	21.96	0.916	-	s
1448.58	327.92	5669.	3655.	1.015	4.84	1.382	-	
1798.24	409.21	3339.	1844.	0.512	9.03	1.271	-	s
1852.61	421.85	2248.	160.	0.044	51.93	0.567	-	s
2310.89	528.40	2677.	298.	0.083	44.13	0.270	-	s
2457.67	562.53	1736.	830.	0.230	11.58	1.608	-	
2504.92	573.52	482.	44.	0.012	72.16	0.431	-	c
2885.68	662.07	1089.	130.	0.036	44.67	0.254	-	s
3236.84	755.37	1600.	816.	0.227	15.31	1.946	-	M
3359.28	772.38	1226.	941.	0.261	6.19	2.003	-	D
3403.12	782.41	1686.	246.	0.068	24.44	2.011	-	D
3456.75	794.89	1051.	2286.	0.635	3.73	1.675	-	M
3610.94	830.68	976.	275.	0.076	17.15	2.049	-	D
3631.49	835.46	1044.	798.	0.222	6.73	2.053	-	D
3808.04	876.60	468.	240.	0.067	21.51	0.492	-	s

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 1 Sigma%	FWHM keV		Suspected Nuclide
3925.24	903.96	691.	510.	0.142	8.54	2.109	-	D
4054.09	933.84	679.	342.	0.095	18.47	1.331	-	s
5572.93	1287.27	473.	154.	0.043	40.02	0.517	-	sM
6885.43	1592.80	370.	582.	0.162	10.49	1.465	-	s
7083.32	1638.88	282.	249.	0.069	21.02	0.451	-	s
7255.49	1678.97	160.	128.	0.035	25.51	0.429	-	s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

This section based on library: 1001a.Lib

The library has energies which are not separable.

Laboratory: RSSI

Appendix C

Field Gamma Survey Form

AECOM

Sheet ___ of ___

RADIATION SURVEY FORM - GENERAL

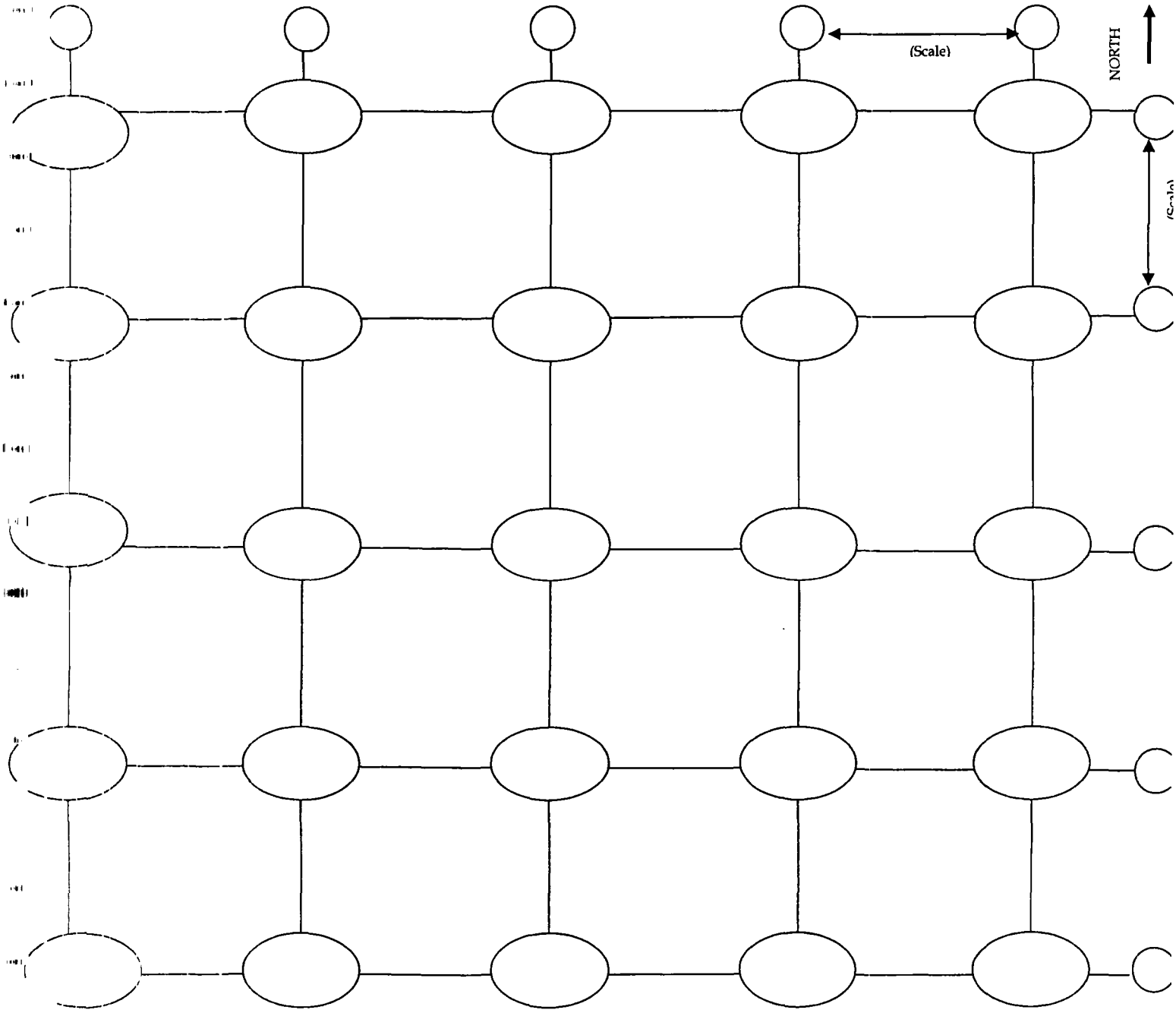
Project No. _____ Project Name _____

Date _____ Technician _____

Inst. Model _____ Serial No. _____

Inst. Calibrated (Y/N)? _____ Lift Elevation _____

Write grid designations in circles. Indicate excavated area with heavy line. Record counts at intersections in CPM. Indicate areas with audible alarms by shading the area.



Appendix D

Standard Operating Procedures

SOP-210 **Gamma Radiological Surveys**

SOP-212 **Air Monitoring Procedure**

SOP-214 ***Soil Sampling Procedure***

SOP-215 **Field Logbook Procedure**

SOP-217 **Excavation Procedure**

SOP-223 **Verification Survey**

SOP-343 **Operation of Ludlum Model 2221 Scaler/Ratemeter with Ludlum Model 44-10 2"x2" NaI Scintillation Probe**

SOP-345 **Survey for Surface Contamination and Release of Equipment for Unrestricted Use**

SOP-347 **Decontamination**

SOP-364 **Sample Preparation Procedure for Gamma Spectral Analysis**

211 EAST GRAND AVENUE
CHICAGO, IL

STANDARD OPERATING PROCEDURE

Title: Verification Survey

Document: SOP-223

Revision Number: 1

Date: December 8, 2010

Replaces: Revision 0

VERIFICATION SURVEY PROCEDURE

1.0 PURPOSE

The purpose of this procedure is to present protocol for conducting verification surveys at the excavations at the Site.

2.0 SCOPE

This procedure applies to all completed excavations that are done as a result of the excavation area being identified as containing soil exceeding the cleanup criteria.

3.0 REFERENCES

SOP-210 - Gamma Radiological Survey

4.0 EQUIPMENT AND MATERIALS

None

5.0 PROCEDURE

5.1 Equipment and Materials

Equipment used for verification survey may include the following:

5.1.1 Compass or theodolite

5.1.2 Cloth or steel tape

5.1.3 Stakes, survey flags, or spray paint

5.2 Grid Layout

5.2.1 A confirmation/pre-verification and verification survey may be conducted at remediated excavations.

5.2.2 The grid size (10-meter X 10-meter or less) and locations used for the confirmation/pre-verification surveys will be essentially identical to those that will be established for the verification survey.

5.2.3 The diagonals across each grid square will be located.

5.2.4 The location halfway between the grid corner and the center of the grid will be located (Basically, the center of the four individual 5-meter X 5-meter quadrants.)

5.3 Confirmation/Pre-verification Sampling

5.3.1 Gamma field measurements will be made according to the procedures described for Gamma Radiological Surveys (SOP-210).

5.3.2 When all measurements within a grid are believed to be less than the cleanup criteria limit, then grid is considered clean and a confirmation sample can be collected. If any field measurements within an excavation are greater than the action criteria limit, then the Field Team Leader shall guide additional soil removal until the excavation measures below the cleanup criteria and a confirmation sample can be collected and analyzed.

5.3.3 Sample Collection

5.3.3.1 The confirmation/pre-verification sample will be a composite sample made up of five subsamples obtained by dividing the 100 m^2 area into four equal quadrants of 5-meter X 5-meter. Four of the subsamples will be collected from the center of the individual 5-meter X 5-meter quadrants, while the fifth subsample will be collected from the center of the 10 meter x 10 meter (or less) verification unit.

5.3.3.2 The material from the five sample aliquots will sifted through a 1/4" sieve to remove rocks, sticks, and other debris greater than 1/4" in size, then combined and homogenized in a stainless steel bowl.

5.3.3.3 Following homogenization, a properly sized aliquot of the homogenized material will be placed in an appropriate sample container(s): 20ml for NUTRANL sample analysis or 500-ml for high resolution gamma spectroscopy analysis.

Note: Only one sample is being prepared for the confirmation/pre-verification NUTRANL analyses, versus the analysis of five samples for verification sample analysis.

5.3.4 Sample Analysis

5.3.4.1 This sample will then be analyzed using NUTRANL or high resolution gamma spectroscopy analysis.

5.3.4.2 If the composite sample analysis results indicate a combined Ra-226/Ra-228 concentration of less than 7.1 pCi/g, AECOM will contact the USEPA and request USEPA conduct the collection of a verification sample.

5.4 Verification Sampling

A verification sample shall be collected once gamma surveying and the confirmation/pre-verification sampling indicates that the base of excavation area is less than 7.1 pCi/g. Verification sampling will be conducted by the USEPA for each verification area not to exceed 100 m^2 (10 meter by 10 meter or less, square in shape or at least reasonably close).

5.4.1 Sample Collection

5.4.1.1 The verification sample will be comprised of a five point composite sample with individual sample aliquots collected from the diagonals and center point of the roughly 10 meter x 10 meter (or less) verification unit.

5.4.1.2 Diagonals will be established through each corner and intersecting at the center.

5.4.1.3 A total of five sample aliquots will be collected from each verification unit:

a. Four sample aliquots will be collected from the midpoint of each diagonal between a corner and the center.

b. One sample aliquot will be collected from the center of each verification unit.

c. Each sample aliquot volume should be at least 500-ml or of sufficient size to ensure there is enough material for a 500-ml sample following 1/4" screening.

5.4.1.4 The material from the five sample aliquots will sifted through a 1/4" sieve to remove rocks, sticks, and other debris greater than 1/4" in size, then combined and homogenized in a stainless steel bowl.

5.4.1.5 Following homogenization, a properly sized aliquot of the homogenized material will be placed in an appropriate sample container: 100-ml for NUTRANL analysis (20ml for each of five NUTRANL sample containers), or 500-ml for high resolution gamma spectroscopy analysis.

5.4.2 Verification Sample Analysis

5.4.2.1 The five individual verification samples will then be analyzed using NUTRANL or a single sample utilizing high resolution gamma spectroscopy analysis.

5.4.2.2 If verification sample analysis results indicate a combined Ra-226/Ra-228 concentration of less than 7.1 pCi/g, AECOM will provide to USEPA a "Notification of Successful Pre-Verification or Verification" form for the verification unit and request a final verification survey or approval to backfill.

5.4.2.3 Upon request by the USEPA, the verification sample will be shipped to the USEPA National Air and Radiation Environmental Laboratory for final high resolution gamma spectroscopy analysis.

6.0 DOCUMENTATION

6.1 A scale drawing of the survey area showing the locations and results of the gamma measurements will be created.

6.2 The drawing and gamma measurements will be delivered to the USEPA with a Notice of Successful Verification and a request for approval to backfill the excavation (Form SOP 223-1).

7.0 QUALITY CONTROL

7.1 Quality control for the verification documentation will be in accordance with applicable SOPs.

For each verification unit of 100 square meters or less (an area with dimensions of 10 meters by 10 meters or less, square in shape or at least reasonably close):

1. Once gamma surveying indicates that the base of excavations are likely less than 7.1 pCi/g, a verification sample shall be collected.

2. The verification sample will be comprised of a 5 point composite sample with individual sample aliquots collected from the diagonals and center point of the roughly 10 meter x 10 meter (or less) verification unit.

3. Diagonals will be established through each corner and intersecting at the center.

4. A total of five sample aliquots will be collected from each verification unit:

    a. Four sample aliquots will be collected from the midpoint of each diagonal between a corner and the center.

    b. One sample aliquot will be collected from the center of each verification unit.

    c. Each sample aliquot volume should be at least 500-ml or of sufficient size to ensure there is enough material for a 500-ml sample following 1/4" screening.

5. The material from the five sample aliquots will sifted through a 1/4" sieve to remove rocks, sticks, and other debris greater than 1/4" in size, then combined and homogenized in a stainless steel bowl.

6. Following homogenization, a properly sized aliquot of the homogenized material will be placed in an appropriate sample container: 100-ml for NUTRANL analysis (20ml for each of five NUTRANL sample containers), or 500-ml for high resolution gamma spectroscopy analysis.

7. This verification sample will then be analyzed by AECOM using NUTRANL or high resolution gamma spectroscopy analysis.

8. If verification sample analysis results indicate a combined Ra-226/Ra-228 concentration of less than 7.1 pCi/g, AECOM will provide to U.S. EPA a "Notification of Successful Pre-Verification or Verification" form for the verification unit and request a final verification survey or approval to backfill.

9. AECOM will then ship the verification sample to the U.S. EPA National Air and Radiation Environmental Laboratory for final high resolution gamma spectroscopy analysis.

FORM 223-1
NOTIFICATION OF SUCCESSFUL VERIFICATION SURVEY

Area Identification: _____

Date of Verification Survey: _____

Time of Verification Survey _____ am/pm

The above-described excavation was surveyed at the time and date indicated above. The survey indicated that all soils have been removed as required by the Site Removal Action Criteria.

Documents pertaining to this survey are attached for review and approval by the USEPA.

Signed: _____

Date: _____

Print Name Steve Kornder _____

Print Title Senior Project Geochemist _____

AECOM

The attached Verification Survey documents were reviewed by USEPA, Region 5 on _____. The results of this survey indicate that the verification criteria as contained in the Administrative Settlement Agreement and Order on Consent.

Authorization is hereby granted to commence backfill and restoration work at this excavation.

Date _____

Print Name _____

Print Title _____

For USEPA Region 5

211 EAST GRAND AVENUE
CHICAGO, IL

STANDARD OPERATING PROCEDURE

Title: Air Monitoring Procedure

Document: SOP-212

Revision Number: 0

Date: November 5, 2010

Replaces: New

AIR MONITORING PROCEDURE

1.0 INTRODUCTION

The Air Monitoring Procedure provides for measuring the concentration of radioactive airborne dust that could be generated and emitted into the atmosphere as a result of the excavation, moving, and loading activities planned at the Site. The objectives of data collection for air monitoring activities are as follows:

- Collect airborne radioactivity data for the purpose of determining the exposure of workers participating in Site activities to airborne particulates
- Collect airborne radioactivity data to measure releases of airborne radioactivity to the environment and ensure that people living and working in the surrounding areas of the Site are not exposed to radiation above acceptable limits
- Collect airborne radioactivity data to evaluate work procedures and Site control measures for the purpose of keeping exposures to both workers and the general public as low as reasonably achievable (ALARA).

2.0 REGULATORY REQUIREMENTS AND ADMINISTRATIVE LIMITS

As specified in 10 CFR Part 20 (unless more restrictive in 32 IAC 340) the licensee must demonstrate compliance with the dose limits for individual members of the public. The Site Air Monitoring Plan is based on being able to demonstrate that the average concentrations of radioactive materials in gaseous and liquid effluents at the boundary of the unrestricted area do not exceed the limits specified in Table 2 of Appendix B to 10 CFR 20. The radionuclides in the thorium and uranium series that could potentially be encountered during Site activities are listed in Table 1 of the Air Monitoring Plan. Th-232 has the most restrictive concentrations for both the Derived Air Concentration (DAC) and Air Effluent Limits.

Th-232 Class W DAC=$5x10^{-13}$μCi/ml Air Effluent=$4x10^{-15}$μCi/ml

Both worker exposure to airborne particulates and effluent release limits will be based on Th-232.

3.0 AIR MONITORING EQUIPMENT AND MATERIALS

- Staplex Model TFIA High Volume Air Samplers (or equivalent)
- Gilan Model BDXII Low Volume Personal Air Sampler (or equivalent)
- Staplex Model TFA810 "Ashless" Filter Papers – 95% collection efficiency of 1-micron particles. Effective efficiency of 70% (penetration absorption 30%)
- Zefon Model 739 MCE Filter Cartridges – 37mm x 0.8um membrane filters
- Ludlum Model 2200 Scaler w/ Model 43-10 alpha scintillation detector
- Radiological Air Sample Data Form – Area Monitors, Form SOP 212-10
- Radiological Air Sample Data Form – Personal Air Monitors Form SOP 212-11

4.0 SITE AIR MONITORING PROCEDURE

4.1 Background Air Quality

One downwind, high volume air sample shall be collected for a minimum of forty hours (five 10-hour days) prior to the commencement of excavation activities. This sample shall be analyzed the day after collection and then again after four days to allow for the decay of short lived radon and thoron daughters. The count, after four days decay, will serve as the official measurement of the background airborne alpha concentration. Future results during Site operations should be compared to this value to see if further engineering controls or procedural changes are warranted.

4.2 Perimeter Air Monitoring – High Volume Samplers

Four air monitoring locations shall be used during all excavation activities. These monitoring units will be at the property boundary or no more than 200 feet from the limits of the areas anticipated to be excavated. Samples shall be collected during all operations where potentially contaminated soils are being excavated, moved, or loaded. One monitor shall be placed on each perimeter of the site (North, South, East, and West) and collect samples at a height between one and two meters above the ground. Monitors will be located so as to provide unobstructed air flow from the source to the monitors. Flow rate through air samplers shall remain between 20 and 60 cubic feet per minute. Air sample filters shall be collected and replaced daily and submitted to the laboratory for analysis. Samples analyzed from the perimeter high volume monitors shall be used to determine the amount of airborne radionuclides leaving the Site.

4.3 Personal Air Monitoring – Lapel Samplers (Low Volume)

All workers participating in Site activities that involve the excavation, movement, or loading of potentially contaminated soils within a radiological exclusion zone shall wear a Personal Air Monitor (PAM) to evaluate the air quality in the worker's breathing zone. The Health and Safety Coordinator may require that additional personnel wear PAMs if there is a potential for that worker to encounter airborne particulates during Site operations. Samples shall be collected the entire time a worker is inside the exclusion zone and the cumulative time recorded. Flow rate through air samples shall remain between 2 and 4 liters per minute. Air sample filters shall be collected and replaced daily and submitted to the laboratory for analysis. Samples analyzed from the PAMs shall be used to determine potential contributions to worker's dose from airborne radionuclides.

5.0 AIR SAMPLE ANALYSIS

The Th-232 decay series contains seven alpha-emitting nuclides: Th-232, Th-228, Ra-224, Rn-220, Po-216, Bi-212 and Po-212. Of these, the first three nuclides can be assumed to be in complete equilibrium. The noble gas Rn-220 (thoron) may be ejected from the original matrix by recoil from the alpha particle decay of Ra-224. The fraction of Rn-220 that is removed via emanation is dependent on several variables, and is assumed to range from 10% to 40%. The emanating fraction is assumed to be transported away from the original matrix. If 40% of the Rn-220 escapes, the activity of the Rn-220 and its three alpha-emitting progeny nuclides will be at 60% of the Th-232 activity. These four alpha-emitting nuclides produce a total of 3.35 alpha emissions per Rn-220 decay. Since the Rn-220 activity is 60% of the Th-232 activity, these four nuclides only emit the equivalent of two alpha particles per Th-232 decay. These two alphas when combined with the three alpha particles from the nuclides in full equilibrium with the parent result in the total emission of the five alpha particles. Thus, the Th-232 contribution will be one-fifth or 20% of the total alpha activity.

For the reasons stated above, gross alpha concentrations shall be divided by a factor of five to determine the air concentration of Th-232, which is the most limiting of the applicable air effluent concentration limits ($4x10^{-15}$ µCi/ml).

5.1 High Volume Sample Analysis

A 1.75 inch diameter cutout shall be obtained from each 8"x10" high volume sample collected. All data pertaining to the sample shall be included on the *Radiological Air Sample Data Form – Area Monitors* worksheet This worksheet contains the calculations required to determine total sample volume and sample concentration.

Each sample shall be analyzed the day after collection for gross alpha concentration. The minimum counting time is 30 minutes for Th-Alpha. The "day after" count will serve as a comparison to identify high gross counts from the previous day. It is expected that naturally occurring radon and thorium daughters will interfere with analysis, so the sample must be reanalyzed in four days. Thoron (Rn-220), if present in

significant amounts, will require up to four days to allow for the decay of its Pb-212 daughter (10.6 hour half life). The count, after four days decay, will serve to be the official measurement of Th-Alpha.

Th-232 is the most restrictive of the applicable radionuclides that may be present during Site operations. The Th-232 contribution will account for 20% of the total alpha activity, so each gross alpha count must be divided by five to determine Th-232 concentration.

Multiple concentration measurements improve both precision and detection capability. Although air samples shall be counted the following day (and again four days later), effluent releases shall be reported on a weekly basis using the following calculation:

Equation A.9 NUREG 1400

$$C_{avg} = \frac{\Sigma T_{s,i} C_i}{\Sigma T_s}$$

where C = effluent concentration in µCi/ml
T_s= duration of sample collection

Sample concentration shall be determined using the following calculation:

Equation 6.9 *NUREG 1400*

$$C = \frac{R_n}{EFKT_S Cf(5)}$$

Where: $R_n = R_g - R_b = T_g/N_g - T_b/N_b$
E = fractional filter efficiency
F = air flow rate through the air sampler, cm^3/min
Cubic feet per hour x 28.316 liters/cfh x 1000 ml/ liter
K = Counting efficiency in cpm/ µCi
T_s = duration of sample collection
Cf = collection vs. analyzed ratio: conversion factor = 0.035

** note: Cf is not part of original NUREG calculation. It has been added to account for the fact that we are only analyzing 3.5% of total filter (i.e., a 1.75 inch circle from an 8 X 10 inch filter minus the 0.3 inch border coverd by the filter holding plate).

5 = Samples are analyzed for gross alpha activity. Gross alpha concentration is to be divided by five to determine Th-232 concentration

5.2 Personal Air Monitor Sample Analysis

Personal Air Monitor (PAM) samples shall be analyzed in the same manner as the high volume perimeters samples. The only exceptions are that samples may be collected over the course of one week and that calculations are performed on a different worksheet – *Radiological Air Sample Data Form – PAM's, Form SOP 212-11.*

The action level for airborne radioactivity shall be 30% of the Derived Air Concentration (DAC) for Th-232 (DAC=$5x10^{-13}$ µCi/ml). When PAM analysis indicates that concentrations have reached 1.5 x 10^{-13} µCi/ml, Level C protection may be considered. It is not anticipated that airborne concentrations will reach this level. Engineering controls, such as wetting of soils, and procedural changes shall be implemented to keep airborne concentrations ALARA.

At the conclusion of the project, data obtained from PAM's shall be used to determine a dose from airborne radionuclides for each monitored worker.

6.0 INVESTIGATIONS AND CORRECTIVE ACTIONS

The Health and Safety Coordinator will perform investigations and responses consisting of one or more of the following actions in the event that Action Levels are exceeded:

- Verification of laboratory data and calculations.
- Analyze and review probable causes.
- Evaluate need for reanalysis or additional analysis on original sample.
- Evaluate need for resampling.
- Evaluate need for sampling of other pathways.
- Evaluate need for notifications to regulators
- Dose assessments/bioassays.

7.0 ATTACHMENTS

- Table 1 *Derived Air Concentrations (DACs) and Effluent Air Concentrations of Selected Radionuclides in the Uranium and Thorium Series*
- Minimum Detectable Concentration Calculation – Area Monitors
- Minimum Detectable Concentration Calculation – PAM's
- Radiological Air Sample Data Form – Area Monitors, Form SOP 212-10
- Radiological Air Sample Data Form – PAM's, Form SOP 212-11

TABLE 1

Derived Air Concentrations (DACs) and Effluent Air Concentrations of Selected Radionuclides in the Uranium and Thorium Series

Radionuclide	Class	10 CFR 20	
		DAC (μCi/ml)	Air Effluent (μCi/ml)
^{238}U	D	$6x10^{-10}$	$30x10^{-12}$
	w	$3x10^{-10}$	$1x10^{-12}$
	Y	$2x10^{-11}$	$6x10^{-14}$
^{234}Th	w	$8x10^{-8}$	$3x10^{-10}$
	Y	$6x10^{-8}$	$2x10^{-10}$
^{234}U	D	$5x10^{-10}$	$3x10^{-12}$
	w	$3x10^{-10}$	$1x10^{-12}$
	Y	$2x10^{-11}$	$5x10^{-14}$
^{230}Th	w	$3x10^{-12}$	$2x10^{-14}$
	Y	$6x10^{-12}$	$3x10^{-14}$
^{226}Ra	w	3x10-10	$9x10^{-13}$
$_{222}Rn$	With Daughters Removed	$4x10^{-6}$	$1x10^{-8}$
	With Daughters Present	$3x10^{-8}$ or 0.33 of working level	$1x10^{-10}$
^{214}Pb	D	$3x10^{-7}$	$1x10^{-9}$
^{214}Bi	D	$3x10^{-7}$	$1x10^{-9}$
	w	$4x10^{-7}$	$1x10^{-9}$
^{210}Pb	D	$1x10^{-10}$	---
^{232}Th	w	$5x10^{-13}$	$4x10^{-15}$
	Y	$1x10^{-12}$	$6x10^{-15}$
^{228}Ra	w	$5x10^{-10}$	$2x10^{-12}$
^{228}Th	w	$4x10^{-12}$	$3x10^{-14}$
	Y	$7x10^{-12}$	$2x10^{-14}$
^{220}Rn	With Daughters Removed	$7x10^{-6}$	$2x10^{-8}$
	With Daughters Present	$9x10^{-9}$ or 1.0 working level	$3x10^{-11}$
^{212}Pb	D	$2x10^{-8}$	$5x10^{-11}$
^{212}Bi	D	$1x10^{-7}$	$3x10^{-10}$
	w	$1x10^{-7}$	$4x10^{-10}$
^{228}Ac	D	$4x10^{-9}$	$2x10^{-11}$
	w	$2x10^{-8}$	$8x10^{-11}$
	Y	$2x10^{-8}$	$6x10^{-11}$
^{234m}Pa	w	$3x10^{-6}$	$1X10^{-8}$
	Y	$3x10^{-6}$	$9x10^{-9}$
^{235}U	D	$6x10^{-10}$	$3x10^{-12}$
	w	$3x10^{-10}$	$1x10^{-12}$
	Y	$2x10^{-11}$	$6x10^{-14}$
^{231}Pa	w	$6x10^{-13}$	$6x10^{-15}$
	Y	$2x10^{-12}$	$8x10^{-15}$
^{227}Ac	D	$2x10^{-13}$	$1x10^{-15}$
	w	$7x10^{-13}$	$4x10^{-15}$
	Y	$2x10^{-12}$	$6x10^{-15}$
^{227}Th	Y	$1x10^{-10}$	$5x10^{-13}$
	w	$1x10^{-10}$	$5x10^{-13}$

FORM SOP 212-10

RADIOLOGICAL AIR SAMPLE DATA FORM – AREA MONITORS

Equation:

Volume (V) = (Pump ml/min.) (Total Sample Time) (count/sample conversion)
Multiply Cubic Feet by 28.316 to Obtain Liters
Ml/min = (L/min.) (1000 ml/L)

SAMPLE COLLECTION

Sample #	Per. By	Date	Sample Start Time	Sample End Time	Total Sample Time	Cubic Ft/min. (CFM)	Count vs. Sampled Conv.	Total Sample Volume (ml)

Equation: Actual Activity = Activity (A) - Background (B)

$$\text{Activity (A)} = \frac{\text{(Net CPM) (1/Eff.)}}{\text{(V) (2.2 E + 6 dpm/uCi) (filter retention factor) (5)}}$$

Sample #	Cal. By	Date	Gross Counts	Net CPM	Detector Efficiency (EFF)	Sample Volume Analyzed (ml)	Sample Concentration (A)µCi/ml	Background Activity (B)µCi/ml	Actual Concentration µCi/ml
4-day recount									

Filter retention factor/absorption correction = 0.7 for Staplex 8x10 ashless paper filter
= 1.0 for 37mm PAM membrane filters

Note: Activity is divided 5 due to the Thorium daughters that are counted with an open window (gross alpha)

Conversion factor for volume analyzed vs. volume sampled for 1.75" diameter cut-out = 0.035

30 minute background count for _____ (date) is _____ cpm

30 minute background count for _____ (date) is _____ cpm

FORM SOP-212-11

RADIOLOGICAL AIR SAMPLE DATA FORM – PAM'S

Equation:

Volume (V) = (Pump liters/min.) (Total Sample Time in minutes) (1000 ml/liter)

Sample Collection

Person Wearing Monitor	Pump #	Sample # Date	Sample Start Time	Sample End Time	Total Sample Time	Cubic liters/min. LPM	Total Sample Volume (ml)

Equation: Actual Activity = Activity (A) - Background (B)

$$\text{Activity (A)} = \frac{\text{(Net CPM) (1/Eff.)}}{\text{(V) (2.2 E + 6 dpm/uCi) (filter retention factor) (5)}}$$

Sample Analysis

Sample #	Cal. By	Date	Gross Counts	Net CPM	Detector Efficiency (EFF)	Sample Volume Analyzed (ml)	Sample Concentration (A)μCi/ml	Background Activity (B)μCi/ml	Actual Concentration μCi/ml

Filter retention factor/absorption correction = 0.7 for Staplex 8x10 ashless paper filter
= 1.0 for 37mm PAM membrane filters

Note: Activity is divided 5 due to the Thorium daughters that are counted with an open window (gross alpha)

30 minute background count for _____ is _____ cpm
date

30 minute background count for _____ is _____ cpm
date

MINIMUM DETECTABLE CONCENTRATION CALCULATION – PAMS

Sensidyne Personal Air Monitor Samples analyzed on Ludlum 43-10 Alpha Counter

$$MDC = \frac{2.71}{n\,E\,F\,K\,T_g\,T_g} + \frac{3.29\,\sqrt{Rb}\left[\frac{1}{Tb}+\frac{1}{Tb}\right]}{n^{1/2}\,E\,F\,K\,T_s}$$

n = number of sampling intervals
E = fractional filter efficiency
F = airflow rate through the sampler in cm^3/min
K = counting efficiency in cpm/µCi
T_s = duration of sample collection in min
T_g = gross counting time
T_b = background counting time
R_n = net count rate in cpm
R_b = background count rate in cpm
C = concentration of radioactive material in the air in µCi/cm^3

N = 5 days of sampling minimum per week
E = 1.0 37mm 0.8 µm MCE Filters
F = 2.5 x 10^3 cm^3/min (or ml/min)
2.5 liters per minute x 1000 ml/l = 2500 ml/min
K = 699300
0.315 count/disintegration x 2.22 x 106 dis/µCi = 699300 cpm/µCi
T_s = 480 min
Based on a minimum of 8 hours per day
T_g = 30 min
T_b = 600 min

Rb = 0.58 cpm, based on 3000 min background count on 9/16 – 9/20/02

$$MDC = \frac{2.71}{(5)\,(1.0)\,(2500)\,(699300)\,(480)\,(30)} + \frac{3.29\,\sqrt{(0.58)}\left[\frac{1}{(600)}+\right]\frac{1}{(30)}}{(2.24)\,(1.0)\,(2500)\,(699300)\,(480)\,(30)}$$

= 2.98 x 10^{-14} µCi/ml (gross alpha weekly MDC)
= 5.96 x 10^{-15} µCi/ml (gross alpha ÷ 5, for Th-232)

MINIMUM DETECTABLE CONCENTRATION CALCULATION

Sensidyne TFIA High Volume Air Samples analyzed on Ludlum 43-10 Alpha Counter

$$MDC = \frac{2.71}{n\,E\,F\,K\,T_g\,T_g} + \frac{3.29\,\sqrt{Rb\left[\frac{1}{Tb}+\frac{1}{Tb}\right]}}{n^{1/2}\,E\,F\,K\,T_s\,cf}$$

NUREG 1400 Air Sampling in the Workplace Appendix A (eq A.17)

n = number of sampling intervals
E = fractional filter efficiency
F = airlow rate through the sampler in cm^3/min
K = counting efficiency in cprn/µCi
T_s = duration of sample collection in min
T_g = gross counting time
T_b = background counting time
R_n = net count rate in cpm
R_b = background count rate in cpm
Cf = count vs. sample conversion
(this is not part of NUREG 1400, however, analysis volume must be taken into account)

n = 5 days of sampling minimum per week
E = 0.7 (referred to as filter retention factor on air sampling form)
F = 1.13×10^6 cm^3/min (or ml/min)
40 ft^3/min x 28.316 liters/ft^3 x 1000 ml/l = 1.13×10^6 ml/min
K = 699300
0.315 count/disintegration x 2.22 x 106 dis/µCi = 699300 cpm/µCi
T_s = 480 min
Based on a minimum of 8 hours per day
T_g = 30 min
T_b = 600 min
Cf = 0.035
8" x 10" original filter size = 80 $inches^2$
0.3 inch border is covered by sampler plate and not sampled = 10.8 $inches^2$
filter cutout = $\pi r^2 = (0.875")^2 (3.14) = 2.41$ $inches^2$
actual sample area = 80 $inches^2$ – 10.8 $inches^2$ = 69.2 $inches^2$
sample analyzed vs. sample collected ration = 2.41/69.2 = 0.035
r_b = 0.58 cpm, based on 3000 min background count on 9/16 – 9/20/02

$$MDC = \frac{2.71}{(5)\,(0.7)\,(1.13E6)\,(699300)\,(0.035)\,(480)\,(30)} + \frac{3.29\,\sqrt{(0.58)\left[\frac{1}{(600)}+\right]\frac{1}{(30)}}}{(2.24)\,(0.7)\,(1.13E6)\,(699300)\,(0.035)(480)\,(30)}$$

= 2.69×10^{-15} µCi/ml (gross alpha weekly MDC)
= 5.39×10^{-16} µCi/ml (gross alpha ÷ 5, for Th-232)

211 EAST GRAND AVENUE
CHICAGO, IL

STANDARD OPERATING PROCEDURE

Title: Soil Sampling Procedure

Document: SOP-214

Revision Number: 0

Date: November 5, 2010

Replaces: New

SOIL SAMPLING PROCEDURE

1.0 PURPOSE

The purpose of this procedure is to present protocol for collecting soil samples for the Site.

2.0 SCOPE

This procedure applies to samples collected for radiological or geotechnical analysis. Soil samples may be collected of potential backfill soils or other soils. The Field Team Leader will coordinate the sampling efforts.

3.0 REFERENCES

U.S. Nuclear Regulatory Commission, NUREG/CR-5849, *Manual for Conducting Radiological Surveys in* Support of License Termination, June 1992.

4.0 EQUIPMENT AND MATERIALS

4.1 Equipment and Materials Management

Downhole tools and samplers are cleaned in accordance with the Decontamination Procedure (SOP-347).

Cuttings, fluids, samples, and water are placed in 55-gallons drums, labeled, properly stored on-site, and disposed of in a manner that does not violate local, state or federal rules or regulations and in a manner that does not damage public or private property.

4.2 Sampling Equipment and Materials

Equipment used for soil sampling includes the following:

- Auger or other Coring Tool
- Shovel and Trowel
- Plastic Collection Bags
- Plastic Sheets (optional)
- Sampling Tracking Form (Form SOP-214-1)
- Field Logbook (SOP-215)
- Field Sample Screening Form (Form SOP-214-2 or holding samples)
- Pin Flags (for marking sample locations)
- Container (for collecting potentially contaminated waste generated during the sampling process) (e.g., gloves, plastic sheets, etc.)
- Bucket (filled with clean rinse water)
- Bucket (for homogenizing samples)
- Stainless Steel Brush
- Moist Towelettes
- Paper Towels
- Latex Gloves
- Survey Instrument (for verifying clean sampling equipment and hands).

Other equipment may be substituted, if necessary, because of availability of the items listed or the conditions encountered at the site. Substitute equipment shall be documented in the Field Logbook and approved by the Field Team Leader.

5.0 SAMPLING PLAN

Selection of the sampling plan to characterize a soil is a function of the goals of the investigation, the variability of the parameters being measured, and the impact of the variability on the conclusions. Samples may be collected randomly or they may be collected from specific areas deliberately chosen to represent the range of conditions expected or unusual conditions of particular interest. In general, randomly chosen samples are appropriate to assess overall site conditions. However, there may be instances where the significance of an observed condition is of interest. The choice of method will, therefore, depend on the specific goals of the sampling activity.

The procedure presents sampling methods based on random sampling. For the reasons stated above, variations to the methods provided in this procedure may be requested by the Field Team Leader. Such variations shall be documented in the Field Logbook by field personnel.

6.0 ON-SITE STOCKPILE SOIL SAMPLING

The following are the steps to be followed for on-site stockpile soil sampling.

6.1. Excavated soil may be stockpiled. Samples from the stockpiles may be analyzed.

6.2. The soil may be stockpiled in piles varying from a few to several thousand cubic yards. Because of this potential variation in pile size, no single method for sampling or type of equipment can be prescribed that will work for every situation. The two basic methods that can be used for sampling stockpiles, core sampling method and lift sampling method, are described in paragraphs 7.3 and 7.4, respectively. Both methods are based on the premise that in order for a sample to be representative of the pile, every particle in the pile must have an equal probability of being included in the sample.

6.3 One of the methods, the core sampling method, assumes that the pile can be completely penetrated using a coring tool (i.e., sampling probe or drill rig). On conical shaped piles, the sample is to be taken approximately perpendicular to the surface of the pile, midway between the peak and the base, to the center of the pile. On piles with flattened tops, the sample is to be taken perpendicular to the surface from the top to the bottom of the pile.

6.4 The other stockpile sampling method, the lift sampling method, assumes that the pile can not be completely penetrated with a sampling tool, and therefore must be sampled either as the soil is placed in lifts onto the pile or before the soil is removed in lifts for use. The samples will, therefore, only be representative of the discrete layer of soil that is exposed to the sampling.

6.5. With either sampling method, to identify the areas to be sampled, the pile shall always be faced looking north. For flat topped piles, divide the stockpile into an imaginary grid with square or rectangular shaped sections approximately equal in area; the grids on flat topped piles should be numbered from left to right, top to bottom. For conical shaped piles, divide the stockpile into an imaginary grid with pie shaped sections of equal areas; the grids on conical shaped piles should be numbered in clockwise pattern.

6.6. Determine the initial number of grids and samples as follows:

Pile Size (cubic yards)	Number of Grids	Number of Lift Samples[1]	Number of Core Samples[2]
< 50	3	3	3
50 to 100	5	5	5
101 to 500 .	6	5	6
500 to 1,000	7	5	7
1,000 to 2,000	8	6	8

Pile Size (cubic yards)	Number of Grids	Number of Lift Samples[1]	Number of Core Samples[2]
2,000 to 4,000	9	6	9
4,000 to 6,000	10	7	10
6,000 to 8,000	11	7	11
8,000 to 10,000	13	8	13
10,000 to 20,000	16	8	16
20,000 to 40,000	20	10	20
40,000 to 70,000	30	15	30
70,000 to 100,000	36	15	36
100,000 to ---[3]	36+	15+	36+

Notes:

1 Take one sample from each grid randomly chosen. In order to choose the grids to be sampled randomly, use some blank sample identification tags and number the tags from one (1) to (n), where (n) represents the number of grids in each pile. Put the tags into a sample bag, shake the bag and reach in and blindly select a tag. Continue selecting tags until the required number of grids are selected. The numbers will be chosen without replacement, that is, without returning the used number to the bag. The samples shall be taken from the grids that correspond to the randomly chosen numbers. An alternative method would be to use a computer generated random numbering system available in various spreadsheet programs (i.e., Excel).

2 From the randomly chosen grids, take one composite sample for approximately every ten (10) feet of soil depth to obtain the required number of samples. For example: if a 98 cubic yard pile is 10 feet high, according to the above table, five (5) composite samples are required (i.e., one for each grid). If an 11,000 cubic yard pile is 30 feet deep, three composite samples, one composite sample at each ten feet of depth, will be taken from 5 of the grids and one composite sample will be taken from a sixth, randomly chosen grid.

3 Add one sample for each additional 10,000 cubic yards.

6.7 Take the sample and submit it to the laboratory for analysis.

6.8. Statistically test the results of the sample analyses to determine how much uniformity the samples show and whether more samples must be taken.

6.9. If necessary, take additional samples and analyze. Continue to repeat steps 6.7 arid 6.8 until there are enough samples to characterize the pile.

6.10. As directed by the Field Team Leader, identify materials suitable for backfill or other purpose for which the sampling was done.

6.11. To compare the sample data with the desired criteria, calculate the average (X bar of all the samples) in the pile using:

$$\bar{x} = \frac{1}{n}\sum_{i=1}^{n} xi$$

6.12 If the average satisfies the desired criteria, the results can be further evaluated to determine whether the data provide a 95 percent confidence level that the true mean (μ) meets the relevant criteria. The Field Team Leader will consult with the Project Coordinator to determine if this further evaluation is required.

7.0 IN-SITU SOIL SAMPLING

This section describes the methods for choosing sample locations and sampling methods.

7.1 Sample Location Selection

Appropriate in-situ soil sample locations are determined by the size and uniformity of the deposit being sampled. The sampling pattern depends upon the size of the area, the uniformity of the soil stratum being sampled, and the volume of soil that is being sampled.

Sampling plans for particular purposes may specify a pre-established sampling frequency in terms of the maximum volume of soil represented by a sample. If the soil being sampled is statistically homogeneous, then the locations for samples can be selected randomly over the area and thickness of the deposit. If the soil is not statistically homogeneous, then the area must be broken into sub-areas within which the soils are statistically homogeneous, and each area sampled separately. The issue of statistical homogeneity is resolved by comparing the range of variation of the property being judged to the acceptability criteria. For example, a deposit of sand and gravel may be statistically homogeneous when judged against a standard that the material not contain boulders and not be homogeneous when judged against a standard that no gravels be larger than one inch.

Clearly, also, the number of samples required to resolve the second comparison may be larger than the number required to resolve the first. The sampling frequencies given in the Sections 10.3 and 10.4 (Stockpile Sampling) may be used as a guide in estimating an initial number of samples, but the actual number required for a particular purpose depends very strongly upon the requirements and materials being sampled.

7.2 Drilling Procedures

No drilling is planned.

8.0 OPERATIONAL SUPPORT SAMPLING

Sampling may be required to support the excavation and restoration action. This sampling may be performed in instances when the Field Team Leader is interested in the significance of an observed variation or when looking for cursory information to provide operational guidance. The choice of the method will, therefore, depend on the specific goals of the sampling activity as determined by the Field Team Leader. This sampling is not a quality activity, and may be performed outside the requirements of this procedure. However, all deviations requested by the Field Team Leader must be documented in the Field Logbook by field personnel.

The sampling technique for surface sampling, subsurface sampling, and stockpile sampling, as described in this procedure, shall be used when sampling in these instances.

9.0 SAMPLE TRACKING

To establish the documentation necessary to track the sample from the time of collection, the sample identification and Sample Tracking Forms must accompany samples that are sent to the laboratory.

All potentially contaminated samples to be submitted to the laboratory will be screened for radiation in the field. Information obtained from this survey will be documented on the Sample Tracking Form (Form SOP 214-1). Samples taken from potential borrow areas generally are not screened.

10.0 SAMPLING METHODS

10.1 Surface Soil Sampling

10.1.1. If necessary, to minimize contamination, spread a clean sheet of plastic next to the area to be sampled; assemble the sampling equipment required.

10.1.2. Enter the complete information on the Sample Tracking Form:

- Sample Number
- Sample Matrix
- Sample Location
- Purpose of Sample Collection
- Include applicable comments regarding the sample, location, weather, conditions, or other factors that may be relevant
- Collected by (your name)

10.1.3. Mark the collection bag or prepare the identification tag for the sample.

10.1.4 Collect the soil samples that are representative of the soil in the area surveyed. Use a shovel or trowel to collect soil from the depth required.

10.1.5 Remove rocks, sticks, and foreign objects greater than approximately one-quarter (1/4) inch.

Stir and homogenize the soil in a bucket as much as practicable. Using the hand trowel, randomly scoop the soil from the bucket. Saving each of the scoops of material to collect the required sample size; return the other material to the sampling locations.

10.1.6 Attach the identification tag to the sample bag if appropriate and place the bag in the sample container.

10.1.7 Decontaminate the sampling equipment as required by Section 11.

10.1.8 Return any location markers (such as pin flags) that, were removed in order to sample. Fill in all sampling holes to eliminate a possible tripping hazard.

10.1.9 If specific data are not available, mark a pin flag with the sample identification number and place the flag at the center of the sampling location before leaving.

10.2 Subsurface Sampling (Undisturbed Soils)

10.2.1 If necessary, to minimize contamination, spread a clean sheet of plastic next to the area to be sampled; assemble the sampling equipment required.

10.2.2 Enter the complete information on the Sample Tracking Form

- Sample Number
- Sample Matrix
- Sample Location
- Purpose of Sample Collection
- Include applicable comments regarding the sample, location, weather, conditions, or other factors that may be relevant
- Collected by (your name)

10.2.3 Mark the collection bag or prepare the identification tag for the sample.

10.2.4 Sample the material using a hand core sampling tool or hammer driven split spoon sampler.

Alternatively, an auger method may be used.

Cut a hole, approximately six (6) inches in diameter, in the center of a plastic sheet. Center the sheet of plastic over the area to be sampled. Using an auger, drill through the hole in the plastic to the desired sampling depth; keep the auger turning until no more material comes up. The soil around the hole, on the plastic sheet, is fairly well mixed and representative of the interval just drilled.

If the soil sample is to be obtained from a particular depth (not a composite from surface to depth), and the material refuses to pass into the coring tool, the following sampling method will be performed. Drill through the hole in the plastic to the top of the desired sampling depth; keep the auger turning until no more material comes up. Remove the auger and sample the material using a hand core sampling tool or hammer driven spilt spoon sampler. The few inches of the sample obtained may constitute sidewall slough and should not be part of the desired sample. The sample(s) should be collected over six-inch intervals starting below the slough material.

NOTE: If, due to the conditions of the sampling area, this method does not work, an alternative method(s), approved by the Field Team Leader, may be used. Alternative methods, when used, will be documented by the field personnel in the Field Logbook.

10.2.5 Remove rocks, sticks, and foreign objects greater than approximately one-quarter (1/4) inch in diameter.

NOTE: The removed rocks will be collected and submitted as a separate sample.

10.2.6 Using a hand trowel, collect approximately one (1) quart of the augured soil in the plastic sample bag or jar. For core segments, place each 6-9 inch (nominally 5-7 inch) segment in the plastic sample bag or jar.

10.2.7 Label the sample container.

10.2.8 Return unused material to the sampling hole and fill in the hole to eliminate possible tripping hazard.

10.2.9 Decontaminate the sampling equipment as required by Section 11.

10.2.10 When required, mark a pin flag with the sample identification number and place the flag at the center of the sampling location before leaving.

10.3 Stockpile Sampling (Core Sampling Method)

10.3.1 If necessary, to minimize contamination, spread a clean sheet of plastic next to the area to be sampled and assemble the sampling equipment required.

10.3.2 Enter the complete information on the Sample Tracking Form:

- Sample Number
- Sample Matrix
- Sample Location
- Purpose of Sample Collection
- Include applicable comments regarding the sample, location, weather, conditions, or other factors that may be relevant. Identify the approximate size of the stockpile. (A 70 cubic yard pile of soil is approximately ten feet high with a base diameter of

approximately 26 feet.) Include a brief description of the equipment used to obtain the sample (i.e., sub-soil sampler, drill rig, etc.).
- Collected by (your name)

10.3.3 Before sampling, determine the number of grids and samples as described in Section 6.6. Record the information in the Field Logbook.

10.3.4 Mark the collection bag or prepare the identification tags for the samples.

10.3.5 Using an auger or other coring tool, take the required number of samples from the pile. A hollow stem auger will be used when discrete, rather than composite, samples are collected.

10.3.6 Place the sample material in the sample bag and attach the identification tags. Place the sample bag in the container.

10.3.7 Decontaminate the sampling equipment as required by Section 11.

10.4 Stockpile Sampling (Lift Sampling Method)

10.4.1 If necessary, to minimize contamination, spread a clean sheet of plastic next to the area to be sampled and assemble the sampling equipment required.

10.4.2 Enter the complete information on the Sample Tracking Form:

- Sample Number
- Sample Matrix
- Sample Location
- Purpose of Sample Collection
- Include applicable comments regarding the sample, location, weather, conditions, or other factors that may be relevant. Identify the approximate size of the stockpile. (A 70 cubic yard pile of soil is approximately ten feet high with a base diameter of approximately 26 feet.) Include a brief description of the equipment used to obtain the sample (i.e., sub-soil sampler, drill rig, etc.).
- Collected by (your name)

10.4.3 Before sampling, determine the number of grids and samples as described in Section 6.6. Record the information in the Field Logbook.

10.4.4 Mark the collection bag or prepare the identification tags for the samples.

10.4.5 Using the appropriate sampling tool, take the required number of samples from the lift approximately perpendicular to the surface of the lift at the appropriate locations. Composite the sample through the entire lift thickness.

10.4.6 Place the sample material in the sample bag and attach the identification tags. Place the sample bag in the container.

10.4.7 Decontaminate the sampling equipment as required by Section 11.

10.5 Soil Sample Size

10.5.1 Samples collected for NUTRANL analysis used for EPA confirmation shall consist of a batch of five 20 milliliter bottles of soil. If split samples are to be obtained, approximately 1.5 liters shall be collected. Sample size requirements are detailed in Sample Preparation Procedure for Gamma Spectral Analysis (SOP-364).

11.0 EQUIPMENT CLEANING

To avoid cross-contamination, the sampling equipment will be cleaned prior to and between samples. The following steps will be followed to clean equipment.

- Remove loose contamination by gently tapping/shaking the item.
- Using the stainless steel brush or paper towels, remove material that did not dislodge.
- If the item appears to be clean (i.e., no visible clinging soil), proceed to the next sampling area.
- If the item does not appear to be clean or if a survey with the appropriate instrument does not verify that it is, scrub the item with water. While holding the item over the sampling location, rinse the item with water.
- Dry the item with paper towels or repeat the scrubbing sequence as necessary.
- Rinse gloved hands. Change gloves when changing sampling areas if a self-frisking indicates that contamination is present after rinsing.
- Approximately one percent of the time, swipe the item as described in the Gamma Radiological Survey SOP (SOP-210). Submit the swipes to the laboratory for analysis to confirm the effectiveness of the decontamination protocol. (This step is necessary only when sampling soils where radiologic contamination is suspected.)
- Dispose of cleaning materials, plastic sheeting, and gloves as contaminated materials in accordance with instructions provided by the Field Team Leader.

12.0 QUALITY CONTROL

12.1 Quality Control Samples

To evaluate the variance in the soil sampling protocol, field duplicates will be collected at specified intervals. These quality control (QC) samples will be identified and noted in the Field Logbook.

To validate the sampling protocol used for surface sampling, initially one (1) area on every twenty (20) sub-grids sampled.

For surface sampling, the duplicates shall be randomly selected and identified before sampling activities begin. The duplicate sample material will be collected using the next scoop full of material each time the initial sample is saved.

For subsurface samples, one duplicate subsurface sample will be taken for every twenty (20) samples.

For subsurface sampling, the duplicate will be collected from the representative augered material.

For stockpiles, one duplicate will be taken for every twenty (20) stockpile samples, or one each day that stockpile sampling takes place, whichever is greater.

The stockpile duplicate will be taken from the node of two grids. The duplicates will be randomly selected and identified before the sampling begins.

The Field Team Leader will calculate the mean and the standard deviation for the samples analyzed. If the duplicate sample results are within three (3) standard deviations of the sample population, the sampling protocols can be considered acceptable.

If the Project Coordinator approves, the Field Team Leader can reduce the frequency of the QC duplicate sampling based on the results obtained. Changes shall be documented in the Field Logbook.

12.2 Data Review

Entries in the Field Logbook will conform to the Field Logbook Standard Operating Procedures.

Daily, the Field Team Leader will review the Field Logbook, resolve any discrepancies that were noted by field personnel, and sign the book to indicate the pages reviewed. If the Field Team Leader recorded the discrepancy, the Quality Assurance Supervisor will review the Field Logbook and resolve any discrepancies that were noted.

NOTE: *Discrepancies relating to reported data will be brought to the attention of the Field Team Leader.*

13.0 HEALTH AND SAFETY

Personal protective equipment and clothing, as required by the Health and Safety Plan, will be used when collecting and handling contaminated soils.

The site radiological conditions will be determined and documented before sampling begins. During the sampling process, the principles of As Low As Reasonably Achievable (ALARA) will be followed.

14.0 RECORDS

The following documents will be maintained as quality records:

- Field Logbooks
- Sampling Tracking Forms
- Results of all Calculations and Statistical Analyses Performed

FORM SOP-214-1

SAMPLE TRACKING FORM

Date: _____ Page _____ of _____

Sample Number	Matrix (S/W)	Location	Collected For	Comments	Collected By

Released by/company	All samples listed above are hereby released except for:	Date/Time
Received by/Company	All samples listed are hereby received except for:	Date/Time
Received by/Company	Data for all samples listed above are hereby received except for:	Date/Time

FORM SOP-214-2

FIELD SAMPLE SCREENING FORM

Sample Type:	Sample ID Number:
Date:	Time:
Counting Instrument:	Sample Date:
Reading Units:	
Signature of Technician:	Date:
Signature of Reviewer:	Date:

211 EAST GRAND AVENUE
CHICAGO, IL

STANDARD OPERATING PROCEDURE

Title: Field Logbook Procedure

Document: SOP-215

Revision Number: 0

Date: November 5, 2010

Replaces: New

FIELD LOGBOOK PROCEDURE

1.0 PURPOSE

This procedure describes standard protocol for the use and control of the Field Logbooks used during the Site remediation.

2.0 SCOPE

This procedure applies to field activities that are associated with the Site cleanup.

3.0 REFERENCES

None

4.0 EQUIPMENT AND MATERIALS

Field Logbook.

Indelible pen or pencil.

5.0 INSTRUCTIONS

5.1 Field Logbook Format

5.1.1 Prior to entering the field, page numbers shall be assigned to the pages of the Field Logbook. Pages shall include the date. Each Field Team Leader and other field personnel taking measurements, observing tests, or performing other related work, will be issued a Field Logbook.

5.1.2 The first set of pages for a day will include the following items (in the order indicated):

- personnel on-site
- contractor personnel on-site (names of employees for the companies represented)
- others on-site (e.g., regulators, visitors)
- weather
- equipment used
- equipment calibration
- sketch of work area
- summary of work.

5.1.3 The remaining pages for a day will record the field activities and should include the following:

- meetings (meeting attendees, person who called the meeting, time, location, decisions, and decision makers)
- start and end time of activities.
- visits by others
- regulator - directed activities
- comments made by regulator, visitor, or other persons visiting Site
- weather and working conditions
- general description of work area.
- sketch work areas and show significant relative locations, etc.
- progression of work (e.g., faster or slower, reason for delays)

- description of equipment used, including general name, brand name, model number and, calibration
- description of amount of material excavated and levels of contamination observed (if known)

5.2 Quality Control

5.2.1 The Field Team Leader, or his designee, will review field logbook for completeness, proper field note correction (single line strikeout), and content.

5.2.2 Field logbooks will be audited at the discretion of the Project Quality Assurance Manager.

211 EAST GRAND AVENUE
CHICAGO, IL

STANDARD OPERATING PROCEDURE

Title: Excavation Procedure

Document: SOP-217

Revision Number: 0

Date: November 5, 2010

Replaces: New

EXCAVATION PROCEDURE

1. PURPOSE

To provide a procedure for excavation for the Site.

2. SCOPE

This procedure will cover Site excavation activities, which are deemed quality critical by the Project Coordinator

3. REFERENCES

1992, NUREG/CR-5849, Manual for Conducting Radiological Surveys in Support of License Termination, Draft Report.

4. EQUIPMENT AND MATERIAL

None

5. INSTRUCTIONS

5.1 Delineation of extent

5.1.1 Delineate initial areas and depths. Areas and depths will extend slightly beyond estimated extent of impacted soil. Initial areal extent will be established using previously completed walkover gamma surveys, down-hole exploration and sampling information, supplemented with gamma survey data.

5.1.2 Initial excavation limits to be within three inches of the estimated bottom limit.

5.2 Excavate delineated soil mass.

5.3 Sampling scheme

5.3.1 Re-establish survey grid.

5.3.1 Locate diagonals across grid square.

5.3.2 Survey the bottom of the excavation as described in SOP-210.

5.4 Pre-Verification or Verification Sampling

5.4.1 If all measurements within a grid are less than the cleanup criteria limit, then grid is clean. No further excavation is required in this grid.

5.4.2 If any measurements within an excavation are greater than the action criteria limit, then additional excavation is required.

5.4.2.1 Proceed through sequence 5.2 through 5.4 again.

5.4.2.2 Mark subareas around grid points that exceeded the action limit.

5.4.2.2 Contact Field Team Leader for guidance of additional excavation.

5.5 Co mpletion

5.5 1 After grid has met criteria, give documentation of delineation, excavation, and sampling to Field Team Leader.

5.5 2 Grid is available for Pre-Verification or Verification Surveying.

6. QUALITY CONTROL

6.1 Quality control for the excavation documentation will be in accordance with applicable SOPs.

211 EAST GRAND AVENUE
CHICAGO, IL

STANDARD OPERATING PROCEDURE

Title: Verification Survey

Document: SOP-223

Revision Number: 0

Date: November 5, 2010

Replaces: New

VERIFICATION SURVEY PROCEDURE

1.0 PURPOSE

The purpose of this procedure is to present protocol for conducting verification surveys at the excavations at the Site.

2.0 SCOPE

This procedure applies to all completed excavations that are done as a result of the excavation area being identified as containing soil exceeding the cleanup criteria.

3.0 REFERENCES

SOP-210 - Gamma Radiological Survey

4.0 EQUIPMENT AND MATERIALS

None

5.0 PROCEDURE

5.1 Equipment and Materials

Equipment used for verification survey may include the following:

5.1.1 Compass or theodolite

5.1.2 Cloth or steel tape

5.1.3 Stakes, survey flags, or spray paint

5.2 Grid Layout

5.2.1 The verification survey will be conducted at all excavations.

5.2.2 The grid used for the AECOM Survey, or similar locations will be re-established for the verification survey.

5.2.3 The diagonals across each grid square will be located.

5.2.4 The location halfway between the grid corner and the center of the grid will be located.

5.3 VERIFICATION

5.3.1 Measurements will be made according to the procedures described for Gamma Radiological Surveys (SOP-210).

5.3.2 If all measurements within a grid are less than the cleanup criteria limit, then grid is clean. No further excavation is required in this grid.

5.3.3 If any measurements within an excavation are greater than the action criteria limit, then the Field Team Leader shall guide additional soil removal until the excavation measures below the cleanup criteria.

6.0 DOCUMENTATION

6.1 A scale drawing of the survey area showing the locations and results of the gamma measurements will be created.

6.2 The drawing and gamma measurements will be delivered to the USEPA with a Notice of Successful Verification and a request for approval to backfill the excavation (Form SOP 223-1).

7.0 QUALITY CONTROL

7.1 Quality control for the verification documentation will be in accordance with applicable SOPs.

FORM 223-1
NOTIFICATION OF SUCCESSFUL VERIFICATION SURVEY

Area Identification: _____

Date of Verification Survey: _____

Time of Verification Survey _____ am/pm

The above-described excavation was surveyed at the time and date indicated above. The survey indicated that all soils have been removed as required by the Site Removal Action Criteria.

Documents pertaining to this survey are attached for review and approval by the USEPA.

Signed: _____

Date: _____

Print Name Steve Kornder _____

Print Title Senior Project Geochemist _____

AECOM

The attached Verification Survey documents were reviewed by USEPA, Region 5 on _____. The results of this survey indicate that the verification criteria as contained in the Administrative Settlement Agreement and Order on Consent.

Authorization is hereby granted to commence backfill and restoration work at this excavation.

Date _____

Print Name _____

Print Title _____

For USEPA Region 5

211 EAST GRAND AVENUE
CHICAGO, IL

STANDARD OPERATING PROCEDURE

Title: Operation of Ludlum Model 2221 Scaler/Ratemeter with Ludlum Model 44-10 2"x2" Nal Scintillation Probe

Document: SOP-343

Revision Number: 0

Date: November 5, 2010

Replaces: New

Operation of Ludlum Model 2221 Scaler/Ratemeter with Ludlum Model 44-10 2"x2" NaI Scintillation Probe

1.0 SCOPE

1.1 Purpose

The Ludlum Model 2221 Scaler/Ratemeter with Ludlum Model 44-10 2"x2" Scintillation Probe is used to perform gamma radiological screening surveys over soil surfaces. In addition to screening surveys, the instrument can collect integrated count rate data at fixed locations

1.2 Applicability

The Ludlum Model 2221 Scaler/Ratemeter with Ludlum Model 44-10 2"x2" Scintillation Probe is used to perform gamma radiological screening in accordance with SOP 210 "Gamma Radiological Screening Surveys".

2.0 REFERENCES

2.1 Ludlum Model 2221 Scaler/Ratemeter Operation Manual

3.0 EQUIPMENT AND MATERIALS

The following equipment may be used as part of the survey programs. Other equipment may be substituted if necessary because of availability of the items listed or the conditions encountered at the site.

- Ludlum Model 2221 Scaler/Ratemeter
- Ludlum Model 44-10 2"x2" NaI Scintillation Detector
- NIST Traceable Radiation Check Source

4.0 PROCEDURE

4.1 Check for Current Calibration Sticker

4.1.1 Survey Meter shall be calibrated within the last 12 months and be affixed with a current calibration sticker. Meter shall be calibrated according to manufacturer's instructions with appropriate NIST traceable sources.

4.2 Check Batteries

4.2.1 Press the "BAT" button

4.2.2 The digital readout should read greater than "5.0". Record result on "Daily Radiation Survey Instrument Function Check" form (see Attachment 1).

4.2.3 Replace 4 D batteries if needed before use.

4.3 Verify Background

4.3.1 Set control switch to "DIG RATE".

4.3.2 Go to an area away from Exclusion Zone or where radioactive contamination is not present. Record result on "Daily Radiation Survey Instrument Function Check" form (see Attachment 1).

4.3.3 Site Specific background count rates shall be established for each instrument prior to initiating excavation activities.

4.3.4 Compare the observed count rate to the pre-established background count rate.

4.3.5 Do not use the meter if the observed count rate varies greater than +/- 10% from the pre-established background count rate unless it can be established appropriately why background conditions have changed.

4.4 Perform Meter Operation Check

4.4.1 Set control switch to "SCALER"

4.4.2 On the calibration sticker the operation check value will be noted and the survey configuration required to perform the check.

4.4.3 Place detector probe on top of the check source holder.

4.4.4 Press "Count" to collect a one minute integrated count.

4.4.5 Record operational check reading indicated on the digital readout. Record result on "Daily Radiation Survey Instrument Function Check" form (see Attachment 1).

4.4.6 Observed reading should be within +/- 10% of recorded operational check value.

4.4.7 Do not use the meter if the operational check fall outside of the acceptable range

4.5 Performing Radiation Surveys

4.5.1 Set Control switch to "DIG RATE"

4.5.2 Hold the probe at a consistent height no further than 6 inches away from surface being surveyed

4.5.3 Move the probe slowly over the surface being surveys at a rate of no more than 0.5 meter per second.

4.5.4 Walk over survey area with spacing between passes not to exceed 1 meter.

4.5.5 Record count rates, as needed.

5.0 RECORDS/REPORTS/NOTIFICATIONS

Refer to SOP-210 for documentation required when performing Gamma Radiological Screening Surveys.

ATTACHMENT 1

LUDLUM MODEL 2221 DAILY RADIATION SURVEY INSTRUMENTATION FUNCTION CHECK

Instrument Serial Number: _____

Probe Model Number: _____

Probe Serial Number: _____

Check Source ID Number: _____

Acceptable Source Count Rate (+/- 10%): _____

Acceptable Background Count Rate (+/- 10%): _____

Date	Time	Physical Check	Battery Check	Background Counts (CPM)	Source Counts (CPM)	Performed By (Initials)

211 EAST GRAND AVENUE
CHICAGO, IL

STANDARD OPERATING PROCEDURE

Title: Surveys for Surface Contamination and Release of Equipment for Unrestricted Use

Document: SOP-345

Revision Number: 0

Date: November 5, 2010 Replaces: New

SURVEYS FOR SURFACE CONTAMINATION AND RELEASE OF EQUIPMENT FOR UNRESTRICTED USE

1.0 SCOPE

1.1 Purpose

This procedure provides the methods for the detection and measurement of radioactive contamination within the site areas, it provides the methods for evaluating contamination, and establishes the criteria for releasing equipment or materials out of the Exclusion Zone. These methods are to be used to minimize the spread of radioactive contamination.

1.2 Applicability

This procedure applies to surveys that are performed on building surfaces, vehicles, equipment, materials (herein referred to as equipment) at the site and to the site personnel, who are required to monitor and release the equipment.

2.0 REFERENCES

2.1 10 CFR Part 20 Standards for Protection Against Radiation

2.2 U. S. Nuclear Regulatory Commission (USNRC) Regulatory Guide 1.86

2.3 Health and Safety Plan for radiologically impacted soil removal, Rehabilitation Institute of Chicago

2.4 NUREG CR5849 Manual for Conducting Radiological Surveys in Support of License Termination

3.0 DEFINITIONS

3.1 Beta-Gamma to Alpha Decay Ratio

A thorium-232 decay series produces about 0.5 beta-gamma decays for every one alpha decay. This ratio allows the limits for alpha contamination to be verified using beta-gamma survey instruments.

3.2 Clean Area

This term defines radiation conditions within a specified area. An area where the radiation levels and contamination levels are maintained below 2 mrem/hr and 33 dpm/100 cm^2 alpha respectively.
Contamination Surveys

An assessment that may include, as appropriate, surveys for loose and fixed contamination through the use of direct frisks, large area wipes and smears, to locate and quantify the radioactive material present.

3.4 Exclusion Zone

The area on one side of the Control Line that includes Contamination Control Areas, Radiation Areas, and Airborne Radioactivity Areas.

3.5 Large Area Wipes (LAWs)

Paper towels or muslin used to wipe large areas to identify the presence of loose contamination.

3.6 Lower Limit of Detection (LLD)

The smallest amount of a radionuclide in a sample that will be detected with a probability of non-detection (Type 1 error) while accepting a probability of erroneously detecting that radionuclide in a blank sample (Type II error). These probabilities are 0.05 (5% chance of Type I or II errors). See Attachment 5 - "LLD Calculation' sheet.

3.7 Smears

Typically 2 inch disk type paper material. Smears are normally taken to identify and quantify loose contamination.

3.8 Unrestricted Release

Release of equipment or materials from the Exclusion Zone to any destination other than a licensed facility.

4.0 REQUIREMENTS

4.1 Prerequisites

4.1.1 Health Physics personnel shall ensure that all portable survey equipment used for this procedure are properly functioning and have a valid calibration sticker.

4.1.2 The Health Physics Supervisor or designee shall ensure that all personnel who are required to perform this procedure are properly trained and understand this procedure.

4.1.3 Equipment, vehicles and areas should be free of visible dirt, mud or dust prior to performing a contamination survey.

4.2 Tools, Material, Equipment

4.2.1 The following counting equipment, or their equivalents, should be used for performing contamination surveys on equipment and materials:

- Personnel and Equipment Frisking: Ludlum Model 3 Survey Meter with attached pancake G-M probe

- Alpha Smear Counting: Ludlum 2200 Scaler with attached Model 43-10 Alpha Scintillation Counter

4.2.2 Survey Maps (or lists) should be produced for each applicable type of equipment. Sketches of building surfaces (walls, floors, etc.), identifying the surveyed grids, should be produced for each surveyed building.

4.3 Precautions, Limits

4.3.1 Direct and removable surveys should not be performed on wet surfaces for alpha contamination. Wet surfaces should be surveyed only for beta-gamma contamination. However, the Health Physics Supervisor shall make the final determination as to when a wet surface is to be surveyed.

4.4 Acceptance Criteria

4.4.1 Prior to unrestricted release from the Exclusion Zone, all vehicles, equipment and materials shall be surveyed for contamination. If contamination is found, then the vehicle, equipment, or material should be decontaminated in order to be within the applicable

surface contamination release limits per Attachment 3 and Attachment 6 (Beta-Gamma Survey of Truck Tires) shall be used as a guideline for meeting Department of Transportation (49CFR173.443) release criteria, when performing surveys on wet surfaces.

4.4.2 The release of items from clean areas within the Exclusion Zone will be controlled by specific criteria established on a case by case basis and approved by the Health Physics Supervisor.

5.0 PROCEDURE

5.1 Routine Surface Contamination Surveys

5.1.1 Routine surveys shall be performed by trained personnel (typically by Health Physics Technicians), in accordance with this procedure and as scheduled by the Health Physics Supervisor.

5.1.2 Routine contamination surveys are not required in the Exclusion Zone.

5.1.3 Support Zone and Contamination Reduction Zone shall be surveyed at least weekly to ensure that cross contamination is not occurring. The clean side of the Contamination Reduction Zone should be surveyed each work day.

5.1.4 Other surveys will be performed, as appropriate, to support Special Work Permits, the movement of equipment from radioactive material areas to clean areas, and to evaluate radiological conditions in specific work areas when directed by the Health Physics Supervisor.

5.2 Support/ Contamination Reduction Zone- Surface Contamination Surveys

5.2.1 Survey techniques may employ the use of large area wipes, smears, or direct frisks as appropriate to the area being surveyed.

5.2.2. Large area wipes may be used to assess floor areas for contamination. A sufficient number of large area wipes should be used to evaluate approximately 10% of the floor area being surveyed.

5.2.3 If contamination is found with the large area wipes, a more detailed smear survey should be performed.

5.2.4 Counter tops, office furniture, laboratory equipment, etc., should be included in the contamination surveys. The area immediately on the clean side of the Control Line should be included in the survey.

5.2.5 Smears shall cover approximately 100 cm^2 and should focus on areas with the highest potential for removable contamination. The smears should be placed in an envelope that is labeled with a sequential number corresponding to the Smear Number on the Radiological Survey Data Sheet (see Attachment 1).

5.2.6 The smears shall be analyzed for alpha contamination.

5.3 Equipment- Surface Contamination Surveys

5.3.1 Equipment shall be surveyed for contamination by using large area wipes, smears and by direct frisk as appropriate.

5.3.2 Take an appropriate number of smears to adequately assess the radiological conditions of the item being surveyed.

5.3.3 A large area wipe may be used as an indication of the presence of contamination.

5.3.4 Smears shall cover approximately 100 cm^2 and should focus on areas with the highest potential for removable contamination. The smears should be placed in an envelope that is labeled with a sequential number corresponding to the Smear Number on the Radiological Survey Data Sheet (see Attachment 1).

5.3.5 The smears shall be analyzed for alpha contamination.

5.4 Unrestricted Release

5.4.1 Materials, equipment and vehicles shall be surveyed for contamination prior to unrestricted release from the site, using large area wipes, smears, and by direct frisk.

5.4.2 All building surfaces, large concrete pieces, and other materials having large, smooth surfaces shall be surveyed prior to unrestricted release. A sufficient number of large area wipes and/or smears shall be taken to adequately assess any contamination present.

5.4.3 All equipment intended for unrestricted release from contaminated areas shall be surveyed for removable and fixed contamination. A sufficient number of large area wipes and/or smears shall be taken to adequately assess any contamination present. If removable contamination is within the release criteria, then perform a direct alpha frisk. Particular attention should be given to areas of the vehicle most likely to have become contaminated such as tire exterior surfaces, occupied areas, load areas, wheel wells, and the bottom of the equipment.

5.4.4 Vehicles intended for unrestricted release from contaminated areas shall be surveyed for removable contamination with large area wipes. If no contamination is found, take a confirmatory smear to document each large area wipe. If contamination is found, take an appropriate number of smears to evaluate the removable contamination present. If removable contamination is within the release criteria, then perform a direct alpha frisk. All survey results must be documented.

5.4.5 Vehicles intended for unrestricted release from clean areas in the Exclusion Zone shall be surveyed with large area wipes on accessible tire/track surfaces, with a direct frisk of tire/track surfaces, and with one smear each for two tires The results of the direct frisk and the large area wipes must indicate that the release criteria is met. The smears shall be added to the survey documentation when the results become available.

5.4.6 Large area wipes may be used as an indication of the presence of contamination.

5.4.7 If no contamination is found with a large area wipe, a confirmatory smear shall be taken for documentation.

5.4.8 If contamination is found with the large area wipe, a representative number of smears shall be taken to quantify the removable contamination present.

5.4.9 Smears shall cover approximately 100 cm' and should focus on areas with the highest potential for removable contamination. The smears should be placed in an envelope that is labeled with a sequential number corresponding to the Smear Number on the Radiological Survey Data Sheet (see Attachment 1).

5.4.10 The smears shall be transported to the Site Laboratory for analysis.

5.4.11 Perform a direct frisk on all material being surveyed for unrestricted release.

5.4.12 Personal equipment and articles (radios, pens, paper, clipboards, etc.) can be surveyed with either the large area wipes or by direct frisk, as appropriate.

NOTE
Items that have irregular surfaces, such as radios, should be wiped and frisked. Items with relatively smooth surfaces, such as paper, pens, etc., may be direct frisked only.

5.5 Documentation of Results

5.5.1 The smear counting results and data shall be documented on the Radiological Survey Data Sheet (see Attachment 1). The documentation of the release survey shall include a drawing of the item to be released.

5.5.2 The instructions for completion of the Radiological Survey Data Sheet are contained in Attachment 2.

5.5.3 A request for equipment release form (Attachment 7) shall be initiated by the equipment owner to track the decontamination process.

6.0 RECORDS/REPORTS/NOTIFICATIONS

6.1 The Health Physics Supervisor and the Project Coordinator shall review and approve all completed survey forms required by this procedure, to comply with reference 2.5 above.

6.2 The survey maps shall be uniquely numbered and retained by Health Physics for project filing. Single item survey maps shall be attached to the survey results.

7.0 ATTACHMENTS

7.1 Attachment 1 - Radiological Survey Data Sheet (example)

7.2 Attachment 2 - Radiological Survey Data Sheet Instructions

7.3 Attachment 3 - Surface Contamination Release Limits

7.4 Attachment 4 - Large Area Wipes on Truck Tires

7.5 Attachment 5 - LLD Calculation

7.6 Attachment 6 - Beta- Gamma survey of Truck Tires (wet surfaces)

7.7 Attachment 7 - Request For Equipment Release

Attachment 1

RADIOLOGICAL SURVEY DATA SHEET

Page ___ of ___

	00 ___ Vehicle	98 ___ Equipment	___ ___ Building ___ Other
Item Description			

Reference	YR	MO	Day	Item	No.	Performed By:

Alpha Survey Instrumentation

Beta Survey Instrumentation

Location	Smear Number	Alpha Activity (dpm/100cm^2)			Beta Gamma Direct (CPM)
		Direct	Removable	Fixed	

REMARKS

Reviewed By:	Date:

ATTACHMENT 2

RADIOLOGICAL SURVEY DATA SHEET INSTRUCTIONS

1. Select the appropriate survey category.

2. Enter the purpose of the survey in the "ITEM DESCRIPTION" section. Be specific:

   - Vehicle survey for release from the site.
   - Tools and equipment for use in the clean area.
   - S WP support, include the S WP number.

3. Enter the survey date.

4. Enter the reference number - Year, Month, Date, Item (Use coding for categories at the top of the form) and Number.

5. Enter your signature in the "PERFORMED BY" section.

6. Enter the instrument(s), serial number(s), and background reading(s) for the survey instruments used for this survey.

7. Enter the "LOCATION OF READING." Enter descriptions such as, the location and item being surveyed, vehicle number, smear location on vehicle, etc.

8. Enter the number of the smear or large area wipe in the "SMEAR NUMBER" section.

9. All data in the "ALPHA ACTIVITY" section is recorded in dpm/100cmz, except large area wipe data.

   - If equipment/material is directly frisked, the reading from the Ludlum Model 3 with pancake G-M probe is converted to dpm/100cm~ by multiplying ccpm by a factor of 4 (Gross cpm - Background cpm X 4) and enter the result in the "DIRECT" column. If the instrument response cannot be distinguished from background enter <200 dpm/l00cm^2.

   - The "REMOVABLE" column may contain the result from a smear or the result from a large area wipe. Smear results that are less than the LLD shall be recorded as less than the numerical LLD value for the instrument in use. As an example, if the LLD for the 65000 is 3 dpm, then the result will should be recorded as <3 dpm/100cm^2. All results should be rounded to the nearest whole number. Results from LAWs should be recorded as dpm without regard to area, unless specific instructions are given to calculate the result per area, as in Attachment 4. Results that do not exceed background should be recorded as BKG (Background).

   - Fixed contamination is the difference between the direct frisk results and the removable contamination results. If no fixed contamination is detectable, enter N/A in the "FIXED" column.

10. If a "BETA-GAMMA DIRECT" survey is performed, record the results as ccpm.

11. In the "REMARKS" section, record any identifying data on counting equipment and any other information needed for explanation or interpretation of survey data. If large area wipes are included in the removable contamination data without regard to area, note this in the "REMARKS" section.

ATTACHMENT 3

SURFACE CONTAMINATION RELEASE LIMITS

Average[a] Removable (dpm/100 cm^2)	Maximum Removable (dpm/100 cm^2)	Average[a] Fixed (dpm/100 cm^2)	Maximum Fixed (dpm/100 cm^2)
20	100	1,000	5,000
Equivalent Beta-Gamma Measurements [b,c]			
17	50	500	2,500

a The contamination levels may be averaged over one (1) square meter provided the maximum activity per any 100 cm^2 area within the one (1) square meter is less than the maximum applicable release limit.

b Beta-gamma release limits derived from the beta-gamma to alpha ratio.

c Beta-gamma surveys are not normally performed for release purposes. If alpha contamination is verified to be within specified release limits, the alpha to beta-gamma ratio indicates that the beta-gamma is also within limits.

Beta-gamma frisks may be used as appropriate to:

- Estimate contamination levels prior to performing release surveys.
- Estimate levels of contamination present on equipment, materials and work areas.

The results of direct beta-gamma frisks should be quantified on survey records as CCPM (Corrected Counts Per Minute).

Results that are less than 100 CCPM should be recorded on the survey record as <100 CCPM.

ATTACHMENT 4

LARGE AREA WIPES ON TRUCK TIRES

Large area wipes are used to wipe an area of approximately 2000 cm^2 on truck tires. The wipes are then frisked with a PAC-4G.

Assuming that 50 cpm above background is readable, it can be assumed that 100 dpm is detectable on a wipe. If the area of the wipe requires two probe areas to cover the wipe, then it can be assumed that we can assess with each measurement approximately half of the total area wiped, or 1000 cm^2 or approximately 100 dpm/1000 cm^2, which is equivalent to 10 dpm/100cm^2.

Frisk results on LAWs, from truck tires, that are nondetectable may be recorded as <10 dpm/100cm^2 in the removable column of the survey report.

ATTACHMENT 5

LLD CALCULATION

$$LLD = \frac{2.71}{T_s} + 3.29\sqrt{\left(\frac{Cb}{Tb}\right)\left(1+\frac{Tb}{Ts}\right)}$$

Where C_b = Background Counts Per Minute
T_b = Background Counting Time in minutes
T_s = Sample Counting Time in minutes

EXAMPLE The background count rate for a given counter is 1.56 cpm over a 50 minute counting time and samples are counted for 2 minutes. The counter has an efficiency of 40.3%.

$$LLD = \frac{2.71}{2} + 3.29\sqrt{\left(\frac{1.56}{50}\right)\left(1+\frac{50}{2}\right)}$$

LLD = 4.32 cpm

$$LLD = \frac{4.32 \text{ cpm}}{.403} = 10.7 \text{ dpm}$$

ATTACHMENT 6

BETA-GAMMA SURVEY OF TRUCK TIRES

The Department of Transportation removable contamination limits in 49CFR 173.443 are 220 dpm alpha contamination and 2200 dpm beta contamination. The most restrictive is the alpha limit. If weather prevents surveying for alpha contamination, then beta-gamma surveys will have to be utilized. The alpha to beta ratio for the thorium chain is approximately 2:1. Using an alpha to beta ratio of 2, the beta equivalent activity for the alpha limit would equal 110 dpm. 110 dpm times the probe efficiency of 0.14 cpm/dpm equals 15.7 cpm. 15.7 cpm above background is not discernable in the field. The diameter of a truck tire is 43 inches. The tread width is 9 inches. The surface area of a truck tire equals 7843.8 cm^2. Approximately 12 inches of tread is on the ground and not surveyable. This represents 3.5% of the surface area of the tire. The remaining 96.5% equals a surface area of 7569.5 cm^2. The typical area of contact for a wipe is about 3.5 inches by 4 inches. This is equal to about 90 cm^2. If the conservative area of 100 cm^2 is used the each cm^2 of wipe is equal to 57.7 cm^2 of tread area. The manufacturer lists the surface area of the probe face as 15.5 cm^2. The tread area survey under the probe equals 894.4 cm^2. To correct the measured counts to an activity/100 cm^2 the counts indicated on the meter face must be multiplied by 8.9. If 15.7 cpm/100 cm^2 beta-gamma activity equals 220 dpm/100 cm^2 alpha contamination then the measured cpm when surveying a wipe would equal 139 cpm. The manufacturer recommends limiting the background count rate to less than 300 cpm in order to see 100 cpm above background. Due to the changing background conditions this value is being reduced to 200 cpm. Therefore, if background is 200 cpm or less and the wipe on a truck tire reads less than 100 cpm above background the truck tire has less than 220 dpm/100 cm^2 removable alpha contamination.

ATTACHMENT 7
REQUEST FOR EQUIPMENT RELEASE

From: _____ Date: _____

TO: HEALTH PHYSICS SUPERVISOR

1 Equipment Type and ID # _____

2 Usage History (locations on site)

_____
_____
_____

3. Scheduled Date to Start Decontamination _____

4. HP Check for Survey Readiness: Technician _____ Date _____

5. Equipment ready for survey ☐ YES ☐ NO

Actions required _____
_____
_____

6.Date and Time Ready for Survey _____

7. Survey Date and Time _____

Results: Pass _____ Fail _____

8. Equipment Release Date _____

9.Approved for Release: HP Supervisor: _____ Date: _____

NOTE; On large earth moving equipment, substantial cleaning may be required prior to HP checking for survey readiness. Once vehicle has been checked and is ready for release survey, it may take as much as 24 hours from the time the survey is initiated until survey results are available. If fixed or removal is located, additional decontamination and surveys are required.

211 EAST GRAND AVENUE
CHICAGO, IL

STANDARD OPERATING PROCEDURE

Title: Decontamination

Document Number: SOP-347

Revision Number: 0

Date: November 5, 2010

Replaces: New

DECONTAMINATION

1.0 SCOPE

1.1 Purpose

The purpose of this procedure is to provide instructions for the decontamination of personnel and equipment.

1.2 Applicability

This procedure is applicable for all equipment and personnel that may become contaminated at the Parkview West site.

2.0 REFERENCES

10 CFR Parts 19 and 20

U. S. Nuclear Regulatory Commission (USNRC) Regulatory Guide 1.86

Health and Safety Plan, Parcel K and Parcel 21 Radiologically Impacted Soil Removal Action, Chicago, Illinois

SOP-345 "Surveys for Surface Contamination and Release of Equipment for Unrestricted Use"

3.0 DEFINITIONS

3.1 Airborne Radioactivity Area

This term defines radiation conditions within a specified area. An area where the average concentration of airborne radioactivity could allow an individual to exceed 12 DAC-hrs over a one week period.

3.2 Clean Area

This term defines radiation conditions within a specified area. An area where the radiation levels and contamination levels are maintained below 2 mrem/hr and 33 dpm/100 cm^2 alpha respectively.

3.3 Contamination Control Area

This term defines radiation conditions within a specified area. An area that may be contaminated to a level greater than a Clean Area.

3.4 Contamination Reduction Zone

The area on one side of the Control Line where personnel can decontaminate, remove their personal protective clothing and equipment.

3.5 Control Line

The demarcation that separates a Clean Area from a Contamination Control Area. The control line is located in the personnel decon facility.

3.6 Craft Personnel

Employees and contractors who physically perform the activities described on the SWP.

3.7 Derived. Air Concentration-Hour (DAC-hour)

DAC-hour is the product of the concentration of radioactive material in air and the time of exposure to that radionuclide.

3.8 Exclusion Zone

The area on one side of the Control Line that includes Contamination Control Areas, Radiation Areas, and Airborne Radioactivity Areas.

3.9 Film Badge

Similar to the TLD, it is used to measure radiation dose.

3.10 Frisking

A personal survey of an individual's clothing and exposed body performed to determine if contamination is present.

3.11 Protective Clothing

Reusable or disposable coveralls, boots and gloves that provide a barrier between contamination and personnel.

3.12 Radiation Area

This term defines radiation conditions within a specified area. An area where the whole body radiation level is greater than 5 mrem/hr.

3.13 Special Work Permit (SWP)

A document which describes the radiological conditions of the work area or task and delineates safety and radiation protection requirements to be followed in the work area or when performing the task.

3.14 Support Zone

The area on one side of the Control Line at the entrance to the Exclusion Zone.

3.15 Optically Stimulated Luminescence Dosimeter (OSL)

A device that measures radiation dose.

4.0 REQUIREMENTS

4.1 Prerequisites

None.

4.2 Tools, Material, Equipment

4.2.1 Decontamination facility.

4.2.2 Soap, water, high pressure spray, scrub brushes and other material as necessary to decontaminate personnel and equipment.

4.3 Precautions, Limits

Decontamination of personnel with material other than soap and water will only be done when authorized by the Site Manager, Health Physics Supervisor, or a medical doctor.

4.4 Acceptance Criteria

4.4.1 Personnel shall be free of contamination after decontamination.

4.4.2 Material and equipment being decontaminated, for unrestricted release, shall meet the release limits established in Reference 2.4.

5.0 PROCEDURE

5.1 Personnel Decontamination

5.1.1 Personnel who are contaminated to greater than 100 ccpm shall notify the health physics technician (HPT) assigned to the Control Line.

5.1.2 The HPT shall resurvey the individual to determine the exact location of the contamination and document it on the Contaminated Personnel or Personal Effects Report (Attachment 1).

5.1.3 If the contamination is spotty, the HPT shall attempt to decontaminate the individual using swabs or soap and water. If the decontamination is successful, document the results on Attachment 1.

a. If contamination is determined to be in an individual's eyes, the eyes may be flushed, using an eye wash station.

b. If contamination remains in the eyes after flushing or is determined to be in an individual's nose or ears, decontamination will be performed under the direction of the Health Physics Supervisor or qualified medical personnel.

c. Cleansing methods for skin decontamination, in order of harshness are as follows:
   1. Lifting off with sticky tape
   2. Flushing with water
   3. Soap and cool water
   4. Mild abrasive soap, soft brush, and water
   5. Detergent (soap powder)
   6. Mixture 50% powdered detergent and 50% cornmeal

5.1.4 If the contamination cannot be easily removed or the contamination is wide spread, the HPT shall escort the individual to the decontamination facility and notify the Health Physics Supervisor and the Site Manager.

5.1.5 The contamination shall be removed by having the individual wash with soap and cool water several times, if necessary. The methods listed above may be used by the HPT.

5.1.6 If the decontamination is successful, document the results on Attachment 1.

5.1.7 If, after several attempts, the contamination is not successfully removed, notify the Health Physics Supervisor.

5.2 Tool Decontamination

5.2.1 All tools being removed from the Exclusion Zone shall be checked by the HPT.

5.2.2 Tools that are contaminated shall be decontaminated before they can be released from the Exclusion Zone.

5.2.3 Tools shall be decontaminated by the users under the direction of the HPT.

5.2.4 Tools can be decontaminated using scrub brushes and soap and water, wiping with damp rags or wipes, soaking in a decontamination solution, using abrasive materials ultrasonic cleaners, or any other method approved by the HPT.

5.2.5 All interior surfaces of the tools must be decontaminated as well prior to the tool being unconditionally released.

5.2.6 If the tool is decontaminated and released by the HPT, the survey results shall be documented on a Radiological Survey Data Sheet (SOP-345 - Attachment 1)

5.2.7 If the tool cannot be decontaminated after several tries, then the tool shall be painted or sprayed with yellow paint to indicate that the item is radioactive material and kept in the Exclusion Zone.

5.3 Equipment Decontamination

5.3.1 Heavy equipment, such as backhoes, bulldozers, trucks, cranes, shall be washed with high pressure water spray prior to being surveyed by the HPT.

5.3.2 The washing of heavy equipment shall be performed in an area designated by health physics.

5.3.3 Once the equipment is washed, it will be surveyed by the HPT. The HPT will identify any areas on the equipment that need further decontamination and will make recommendations on how to further decontaminate.

5.3.4 All surfaces of the equipment must be decontaminated and surveyed. This includes air intakes, air filters and any internal surface that is likely to be contaminated.

5.3.5 Once the equipment has been surveyed and released by the HPT, the survey results shall be documented on a Radiological Survey Data Sheet (SOP-345 - Attachment 1).

6.0 RECORDS/REPORTS/NOTIFICATIONS

6.1 Release surveys and personnel decontaminations shall be documented on the appropriate form.

6.2 Personal contaminations shall be reported to the Health Physics Supervisor and the Site Manager.

7.0 ATTACHMENTS

7.1 Attachment 1 Contaminated Personnel or Personal Effects Report

ATTACHMENT 1

CONTAMINATED PERSONNEL OR PERSONAL EFFECTS REPORT

DATE OF INCIDENT			TIME OF INCIDENT		
NAME			BADGE NO.		
LOCATION OF INCIDENT (SPECIFIC AREA)					
DESCRIPTION	DESCRIBE IN DETAIL ANATOMICAL LOCATION, CONTAMINANT, TYPE OF INJURY, OR CONTAMINATED ARTICLE				
CONTAMINATED ARTICLE OR AREA	DECONTAMINATION AGENT USED	INSTRUMENT	SURVEY RESULTS		FINAL DISPOSITION OF ARTICLES
			BEFORE	AFTER	
WOUND COUNT /5 MIN		BKGD COUNT /5 MIN		SOURCE COUNT /5 MIN	
SAFETY MEASURES	PERTINENT SAFETY MEASURES IN EFFECT ☐ YES ☐ NO		IF NO, EXPLAIN		
REMARKS					
EMPLOYEE SIGNATURE			HEALTH PHYSICS SIGNATURE		

211 EAST GRAND AVENUE
CHICAGO, IL

STANDARD OPERATING PROCEDURE

Title: Sample Preparation Procedure for Gamma Spectral Analysis

Document: SOP-364

Revision Number: 0

Date: November 5, 2010

Replaces: None

SAMPLE PREPARATION PROCEDURE FOR NUTRANL ANALYSIS

1.0 SCOPE

1.1 Purpose

The purpose of this procedure is to provide guidance for the preparation of samples for analysis of radioactive nuclides. This procedure applies specifically to samples prepared for NUTRANL analysis.

1.2 Applicability

This procedure applies to all soil-type environmental samples, including soil, rocks, concrete, and construction debris.

2.0 REFERENCES

2.1 10 CFR Part 20 Standards for Protection Against Radiation

3.0 DEFINITIONS

None

4.0 REQUIREMENTS

4.1 Prerequisites

NONE

4.2 Tools, Materials, Equipment

4.2.1 The following equipment is needed to perform this procedure:

- 20 ml sample vials
- Sieve of one-quarter inch mesh
- Analytical balance
- Marinelli beakers
- Zip-lock bags
- Labels
- Paper towels

4.3 Precautions, Limits

4.3.1 Samples prepared for receipt at field laboratory for NUTRANL analysis are homogenized during sample collection prior to receipt at the field laboratory for analysis. No other physical preparation is performed at the laboratory for screening samples (NUTRANL analysis). Any corrections or analysis other than NUTRANL pulse height analysis shall be performed by an outside contract laboratory. This includes U. S. Environmental Protection Agency (USEPA) verification samples and quality control (QC) samples.

4.3.2 All samples not known to be homogenous must be homogenized prior to analysis.

4.3.3 NUTRANL analysis is designed and calibrated for analysis of low activity samples, specifically for documenting closure at less than the specified cleanup criteria. High activity samples may produce anomalous results due to algorithms in the NUTRANL programming.

4.4 Acceptance Criteria

Proper preparation during sample collection ensures that the samples submitted to the laboratory are representative of the material sampled and suitable for the required analysis. Acceptable samples will be homogeneous with regard to size of material; appearance with regard to color, moisture and soil type; shall not contain materials over the specified maximum gradation; and shall be free of external adhering soil or other materials.

5.0 PROCEDURE

5.1 Al Samples

5.1.1 All samples submitted for analysis must be logged in the chain of custody book. The following information shall be recorded and shall be taken directly from the field chain of custody form or a copy of the chain of custody form must be filed in the chain of custody book.

- Description or grid location
- Purpose of sample which may include:
  - Activity screening
  - Pre-verification
  - Verification
  - Overburden
  - Imported fill
  - Calibration quality control check
- Date and time of sampling
- Originator of sample
- Corresponding count rate from survey meter (optional)

5.1.2 Ensure that outside of sample container is free from potential contamination, by wiping it clean with a paper towel.

5.1.3 Place blank label on outside of container and record the sample ID, which is a unique sequential number used to identify individual samples. The unique sequential number, sample ID, is obtained from project sample log books.

5.1.4 Weigh the sample on the analytical balance. Subtract the empty (tare) weight which is recorded on the side of each vial and record the net weight in grams on the label.

5.1.5 Prepare the sample in accordance with the requirements of the analysis requested.

5.1.6 Samples will have already been homogenized and passed through a ¼ inch mesh during sampling. It should not be necessary for any samples to be re-opened in the field laboratory. This will eliminate the potential for the field laboratory area to become cross-contaminated. This will also allow for ingrowth. Note will be made on the sample label each time the vial is opened.

5.1.7 Verification samples received for the USEPA are also logged in the chain of custody book. Verification samples are prepared in the same manner as others; however, they come in batches of five 20 ml vials. When samples are to be picked up by the USEPA, place each batch of five sub-samples in its own zip-lock bag.

5.2 Quality Control Samples

5.2.1 QC Samples shall be placed into 500 ml Marinelli beakers prior to analysis.

5.2.2 The technician obtaining the sample shall obtain a split sample into a 20 ml sample vial from the Marinelli beaker. This split is performed in the exclusion zone prior to submitting the sample for analysis. The split sample shall be labeled with the same description as the QC sample. The split sample shall be homogeneous with regard to the remainder of the QC sample.

5.2.3 The net weight of the Marinelli beaker shall be noted on the sample label attached to the beaker. The net weight is obtained by subtracting the weight of the beaker (tare) from the total weight of the filled beaker. The tare (empty) weight of the Marinelli beaker is recorded on the outside of each beaker.

5.2.4 The outside laboratory performing analysis of the QC sample shall be responsible for all additional sample preparation, and requested analysis. This includes moisture correction and/or daughter nuclide ingrowth analysis.

5.2.5 Analyze the split sample (20-ml vial) using the NUTRANL System and retain records for future comparison to gamma spectroscopy results.

6.0 RECORDS/REPORTS/NOTIFICATIONS

6.1 Notify the laboratory technician when the samples are properly labeled and ready for analysis.

6.2 Samples shall be retained until all evaluations have been completed and the sample is no longer needed. Samples will not be discarded until written notice is received from USEPA. Samples may be transferred to a secure holding area off-site.

6.3 Retain a paper copy of all sample analysis reports

7.0 ATTACHMENTS

None

Appendix E

Plans

Dust Control Plan
Emergency Contingency Plan
Verification Sampling Plan

211 EAST GRAND AVENUE
CHICAGO, IL

Title: Dust Control Plan

Revisicn Number: 0

Date: Novamber 5, 2010

Replaces: New

DUST CONTROL PLAN

1.0 PURPOSE

The Dust Control Plan (Plan) describes methods AECOM and its contractors will follow to conduct operations and maintain the work area within the subject site (Site) so as to minimize the creation and dispersion of dust. This Plan also contains corrective measures that will be used in the event visual dust is created air monitoring shows excessive particulates, or air sampling indicates limits have been exceeded.

A primary concern during the excavation activities at the Site will be the generation of radioactive particulates from excavation and earth-moving equipment. Fugitive dust generation may be caused by a range of activities including excavation, loading, and transportation of excavated soils. Traffic on the Site also may cause resuspension of particulates.

Dust control measures will be used throughout the excavation and restoration activities at the site, especially during excavation, backfilling, and grading activities.

2.0 GUIDANCE

Dust control will be performed in accordance with the Removal Action Work Plan (Work Plan), the Health and Safety Plan (HASP), and the Air Monitoring Procedure SOP-212. AECOM will perform site perimeter air monitoring in accordance with the Air Monitoring Procedure SOP-212.

3.0 IMPLEMENTATION

AECOM will be responsible for implementing dust control procedures as required in this Plan, the HASP, and the Air Monitoring Procedure SOP-212. The Field Team Leader will be responsible for ensuring compliance with the dust control procedures at the excavation site.

4.0 PRODUCTS

Water will be used in connection with mechanical dust suppression. Chemical foams, such as fire fighter foam, may also be used if approved by USEPA. If available, water will be obtained at the Site. If water cannot be obtained at the Site, temporary sources of water can be provided for construction activities from water trucks parked adjacent to the property or from portable plastic water tanks. Small (1,800 gallon) water trucks equipped with several hundred feet of hose and a pump can be used to spray water. Also, small pumps and hose can be used with the portable tanks to provide sufficient pressure and volume for dust control. In the event that a chemical foam is utilize a Material Safety Data Sheet (MSDS) will be forwarded to US EPA.

5.0 EXECUTION

Procedures to be followed to control dust may include traffic speed control, use of stockpiles, covering vehicles transporting borrow material and waste, and wind screens around excavation areas. These procedures will be utilized during excavation, restoration, transportation and associated materials handling activities.

5.1 Traffic Speeds

Traffic speeds will be maintained in accordance with applicable County, City, State and Federal regulations The speed limit for traffic on the site will not be in excess of 15 miles per hour.

5.2 Use of Stockpiles

Where possible, excavated contaminated materials will be loaded into the transport containers the same day they are excavated. Any radiologically-impacted material stored on-site will be either in containers or in Supersacks if there is not sufficient material to mobilize a container. Stockpiled clean material, including excavated and borrow material, will be piled to minimize dust generation. Further, slopes of stockpiled materials will be minimized in the prevailing wind direction. A 5:1 slope or flatter in the prevailing wind direction will be maintained whenever possible. Stockpiles will be constructed with their length perpendicular to the prevailing wind direction.

Stockpiled material will be covered during periods of high wind or when work on a stockpile is not actively occurring, such as the end of the work day. Stockpiles will be covered with a geomembrane cover to minimize dust generation during excavation and restoration activities. Approved geomembrane covers are Griffolyn TX 1200 manufactured by REEF Industries, Inc., and Sani-Cover SC #250 manufactured by Fluid Systems, Inc., or other equivalent.

5.3 Off-Site Transportation of Excavated Materials

Trucks used for transporting non-contaminated excavated or borrow material will be equipped with truck bed covers (tarps) to prevent the generation of dust from hauling. The tarps will be fastened down tightly to prevent materials from being blown out of the trucks. Empty trucks also will be tarped.

Roll-off containers for transporting low-level radioactive materials, will be lined with plastic or suitable leakproof liner and be equipped with full covers. The covers will be securely fastened to the containers before leaving the excavation area.

Trucks and other heavy equipment will be cleaned to remove mud, soil, and loose dust prior to leaving an excavation area. This cleaning will include the truck tires. Dirt that is tracked onto paved streets will be swept and added to stockpiles at the excavation area.

5.4 Use of Water as a Dust Suppressant

Water will be applied during the course of excavation and restoration activities as directed by the Field Team Leader to prevent, mitigate, or reduce dust resulting from excavation activities. Water will be applied when:

- wind or vehicular traffic may cause visible dust generation;
- exposed surfaces of material stockpiles are potentially dry and wind or handling activities may cause dust generation;
- dust generation is possible during excavation activities on the site;
- hauling of excavated or borrow material may cause visible dust generation in truck beds; or
- dust generation is possible during placement of materials in stockpiles or fill areas.

A water truck or pump and storage tank assembly will apply water to the exposed ground surfaces via hoses pumps, nozzles and other appurtenances as required. The truck or pump/tank assembly also will apply water to control dust generation from exposed surfaces of material stockpiles, excavation activities, and hauling or excavation of borrow material.

Water will be applied in sufficient quantity to prevent generation of dust, but not so as to cause the movement of water beyond site boundaries, ponding, or the disruption of other project site areas. Because the soils will absorb the water, watering is not expected to generate runoff. The Field Team

Leader will monitor the excavation and restoration activities to make sure that enough water is used to adequately control dust, but that not too much water is used so as to create runoff.

5.5 Corrective Measures

If visual dust is created at a location during the excavation and restoration activities, or if air monitoring shows excessive particulates, the following corrective measures will be evaluated and applied as appropriate.

1. Increased wetting of surface areas.
2. Covering additional source areas.
3. Modifying future excavations and stockpiles to decrease the source areas.
4. Halting dust-creating activities until winds moderate.
5. Modify work activities.

If overwatering creates runoff into undisturbed areas, the water will be removed as practical, and the area radiologically surveyed. If radioactivity above the action level is found, the area will be cleaned by removing the contaminated materials, or by other appropriate means. Future occurrences will be prevented by more carefully controlling the amount of water applied by constructing earth berms around the area to retain the water, or by using a method of dust control other than water.

211 EAST GRAND AVENUE
CHICAGO, IL

Title: Emergency Contingency Plan

Revision Number: 0

Date: November 5, 2010

Replaces: New

EMERGENCY CONTINGENCY PLAN

1.0 SCOPE OF PLAN

The purpose of the Emergency Contingency Plan (ECP) is to provide guidance and direction in the event of an unanticipated exposure of an individual to hazardous substances or hazardous conditions related to the excavation and restoration activities at the Site.

Personnel assigned to this project will be required to review thoroughly the contents of this ECP and to strictly adhere to the policies and procedures provided herein.

2.0 EMERGENCY AND EVACUATION PLAN

2.1 Emergency Coordination

The Field Team Leader will coordinate emergency response at the Site. In the event of an emergency, the Field Team Leader will immediately notify the AECOM Project Manager. The AECOM Project Manager will be responsible for notifying the proper response agencies listed in Figure 1, Emergency Phone Numbers. Emergency response procedures, instructions for emergency response to injuries and evacuation plans will be reviewed at safety briefings.

2.2 Emergency Services Contacts

Before field activities commence, the Field Team Leader will inform the appropriate emergency contacts about the nature and duration of work expected at the Site and the type of contaminants and possible health or safety effects or emergencies involving these contaminants.

All hospital treatment should be provided via the 911 Emergency Medical System, with the Chicago Fire Department providing ambulance service. Emergency services can be provided by Northwestern Memorial Hospital located within one-half mile of the Site. The location and possible route to the hospital from the Site, including narrative directions, are shown on Figure 2.

The emergency telephone numbers listed in Figure 1 will be distributed to the Field Team Leader. Emergency numbers will be reviewed every three months by the AECOM Project Manager and revised, as necessary. The AECOM Project Manager will date and sign new revisions. The Field Team Leader will record the date of the revised telephone number list in his daily log book. Upon revision, the figure will be submitted to the USEPA and the City.

2.3 Implementation

The Field Team Leader will implement the emergency action procedures whenever conditions at the Site warrant such action. The Field Team Leader will be responsible for coordinating the evacuation, emergency treatment and emergency transport of site personnel, as necessary, and informing the appropriate coordinating management staff. The following conditions may require implementation of emergency action procedures:

- Fire or explosion on-site.
- Serious personal injury.
- Release of radioactivity exceeding one Annual Limit of Intake (ALI) as defined in 32 IAC 340.1220 in a 24-hour period.
- Release of hazardous materials, including gases or vapors, at elevated levels.
- Unsafe working conditions, such as inclement weather (tornado, hail, etc.).

2.4 Fire or Explosion

If fire or explosion takes place, emergency steps shall include: 1) evacuation of work area; and 2) notification of local fire department and other appropriate emergency response groups listed on Figure 1, as necessary (e.g., if a spill occurs, the emergency spill hotline will be notified).

2.5 Personal Injury

Actions to be taken in the event of personal injury are described in the Health and Safety Plan, Section 4.3.4, Emergency Medical Treatment.

2.6 Evacuation Plan

All project personnel will evacuate the area under the direction of the Field Team Leader. Evacuation from the affected area will be initiated by sounding an alarm, such as an air-horn, megaphone or other form of notification.

A coordinated evacuation will be conducted with all project personnel using the most direct upwind route, avoiding the point of emergency.

All project personnel involved in the evacuation will immediately move to the Decontamination/Transition area and will remain there awaiting further instructions from the Field Team Leader.

Personal Protective Equipment will be used at all times by the project personnel during the evacuation procedures.

2.7 Accident and Incident Reporting

All accidents, injuries and incidents shall be reported to the Field Team Leader. An Accident/Injury Form will be completed by the Field Team Leader, as described in the HASP, Section 4.4, Accident and Incident Reporting.

FIGURE 1
EMERGENCY PHONE NUMBERS

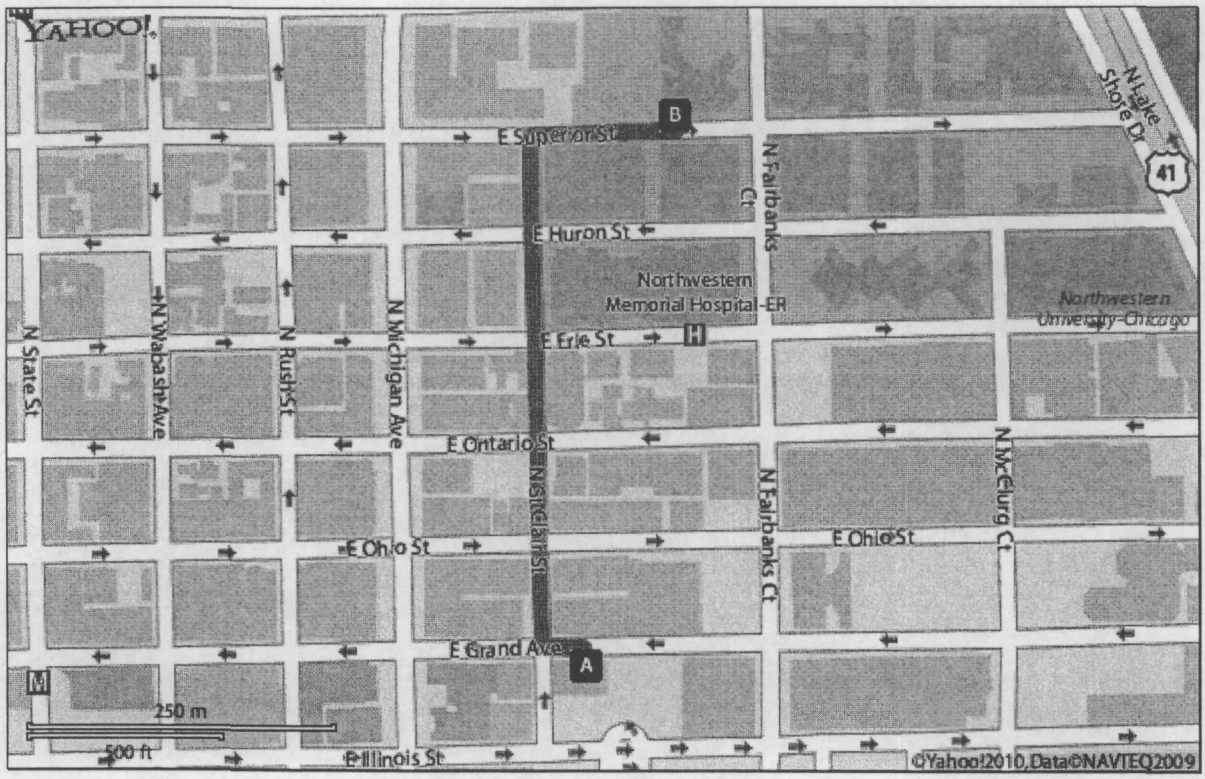
Police Department	911
Fire Department	911
Ambulance	911
Hospital Address Phone	Northwestern Memorial Hospital 250 E. Superior (312) 908-2000 (Ask for ER)
Poison Control Center	(800) 732-2200
USEPA Region 5 24-hours Emergency Number	(312) 353-2318
AECOM Project Coordinator Steven Kornder	847-279-2448 (work) 847-343-6007 (mobile)
AECOM Project Manager Steven Kornder	847-279-2448 (work) 847-343-6007 (mobile)
AECOM Field Team Leader Brian Schmidt	847-778-6727 (mobile)

SECONDARY EMERGENCY NUMBERS

The AECOM Project Manager will evaluate when these agencies should be notified.

National Response Hotline	(800) 424-8802
Illinois Emergency Management Agency	(217) 782-7860
Illinois Environmental Protection Agency Emergency Response Duty Officer	(217) 782-7860 or (217) 782-3657, IEPA ERU during normal working hours.
Illinois Department of Nuclear Safety (IDNS) Emergency Number	(217) 785-0600 (24 hour Radiologic Assistance)

FIGURE 2
HOSPITAL LOCATION AND DIRECTIONS
Northwestern Memorial Hospital
250 E. Superior Street
Chicago, IL 60611



Directions:

1.	**Start at 211 E GRAND AVE, CHICAGO going toward N ST CLAIR ST**	**go 121 ft**
2.	**Turn on N ST CLAIR ST**	**go 0.27 mi**
3.	**Turn on E SUPERIOR ST**	**go 423 ft**
4.	**Arrive at 250 E SUPERIOR ST, CHICAGO, on the left**	

211 EAST GRAND AVENUE
CHICAGO, IL

Title: Verification Sampling Plan

Revision Number: 0

Date: November 5, 2010

Replaces: New

VERIFICATION SAMPLING PLAN

1.0 INTRODUCTION

1.1 Purpose

This Verification Sampling Plan (Plan) describes the sampling activities and analytical methods that will be used to demonstrate the subject site meets the cleanup criteria. By following the protocol included in this plan, the USEPA will demonstrate the Site meets the cleanup criteria described in Section V.2.d of the Unilateral Administrative Order (UAO).

1.2 Scope

The verification survey will be conducted as excavation activities are completed at a Site. The purpose is to demonstrate the soils have been excavated to meet the cleanup criteria described in the UAO. Averaging over areas up to 100 square meters is allowed, but only after reasonable efforts have been made to achieve levels As Low As Reasonably Achievable (ALARA). (Reference SOP-223 "Verification Survey Procedure").

1.3 Contaminants of Concern

The verification program includes testing for specific constituents which are indicative of the contaminants of concern. Constituents of concern that may be encountered on the Site are the entire U-238 and Th-232 decay series; however, measurements will only be made for total radium (Ra-226 and Ra-228).

1.4 References

The following references have been used in developing this Plan:

- Administrative Order by Consent, USEPA, 1996;
- 32 IAC 332.150(b) - Soil Radioactivity and Exposure Rate Criteria;
- DOE Order 5480.11 and 10 CFR 20 - Surface Contamination and Exposures (ALARA); and
- NUREG/CR 5849 "Manual for Conducting Radiological Surveys in Support of License Termination" Draft June 92.

Standard Operating Procedures (SOPs) used during the verification sampling are included in the Standard Operating Procedures - Appendix D.

2.0 EXCAVATION CONTROL

2.1 Gamma Survey

A gamma survey will be done after the excavation is thought to be complete. The survey will comprise verification testing of the excavation.

Gamma measurements will be made over the entirety of the excavation. The procedure and instrumentation used will be 2 x 2 NaI detectors. This procedure provides a gamma measurement survey over an area of approximately one-square-meter. The gamma measurements will be collected over the entire area of the excavation to determine the concentration of radium remaining.

If the gamma survey indicates areas where the measured radium concentration exceeds the cleanup criteria of 5 pCi/g radium (Ra-226 and Ra-228) above background, additional material will be removed

until the measured radium concentration is less than 5 pCi/g above background. Exceptions may be made to this operational criterion with USEPA concurrence.

In addition to the gamma survey, AECOM will obtain samples for laboratory testing to measure the total radium concentration of soils. Such testing may be used to resolve ambiguous gamma survey measurements, to establish or verify gamma/radium correlations, or to provide additional data to verify that the cleanup criteria have been met at the excavation. At least one composite soil sample will be taken for laboratory analysis from each excavation. The samples will be taken in accordance with the soil sampling procedure in SOP-214, and tested for radium (Ra-226 and Ra-228). Apparently clean material below the radiologically-impacted soil may be excavated to facilitate verification. This material will require sampling as overburden if it is to be managed as clean soil for backfill.

2.1.1 Gamma Survey Procedure

The gamma survey will be performed according to the Gamma Survey Standard Operating Procedure (SOP-210).

2.1.2 Documentation

The Verification Gamma Survey drawing described above will be used to document the readings obtained during the gamma survey. The drawing also will contain information pertaining to background gamma radiation levels and instrument calibration.

2.1.3 Quality Control

The gamma survey will be performed by trained individuals who have sufficient skill to obtain accurate and consistent information. All information obtained during gamma surveys will be reviewed by the Field Team Leader for accuracy and consistency.

All field equipment will be calibrated either in accordance with NUREG/CR 5849 "Manual for Conducting Radiological Surveys in Support of License Termination" Draft June 1992 or with industry-recognized protocols. Instrument response background and check source tests will be performed and recorded daily to ensure instrument operations are within the established acceptable range.

At least 5 percent of the survey area will be resurveyed. Readings from the initial survey will be compared to those readings obtained during the quality control (QC) survey to identify instrument malfunctions or reading/document errors.

3.0 DECONTAMINATION

All discarded materials, waste materials, and other field equipment and supplies shall be handled in such a way to prevent the potential spread of contamination during excavation and restoration activities. Discarded items that have contacted contaminated materials will be containerized and stored for disposal at the approved disposal facility. Non-contaminated items to be discarded will be collected for disposal as non-hazardous waste. Personnel and sampling equipment decontamination are described in the Decontamination Procedure included as SOP 347.

Appendix F

Specifications

Section 01010	Summary of Work
Section 01020	Construction Health and Safety
Section 02010	Demolition and Debris Removal
Section 02200	Contaminated Material Loadout and Earthwork
Section 02840	Site Utilities

211 EAST GRAND AVENUE
CHICAGO, IL

Title: Summary of Work

Section 01010

Revision Number: 0

Date: November 5, 2010

Replaces: New

SECTION 01010

SUMMARY OF WORK

PART 1 - GENERAL

1.1 Description of the Project

This project directed by the United States Environmental Protection Agency Region 5 (USEPA) is at a location designated by the USEPA as related to the Lindsay Light II Site in Chicago, Illinois. The work covered by these specifications includes the following.

A. Site Description

Radioactive materials in concentrations above background have been found within the Streeterville area in the City of Chicago. The presumptive source of these materials is the Lindsay Light Company in Chicago.

The Site is defined as the property bounded by East Grand Avenue to the north and a public alley which can be access from North St. Clair Street, Chicago, Illinois. Final definition of the limits of soil excavation and restoration will be the responsibility of the Respondents and their consultants and contractors.

B. Project Description

1. Work for the cleanup of the Site will be excavation and removal of impacted soil.

2. Site preparation includes all of the work which must be done before any excavation and restoration can begin. Some of the work, such as determining background air quality and background radiation, will be common to the entire Site. Other work, such as verifying the extent of contamination and documenting existing physical conditions, will be area-specific.

   a. Access Agreements. Discussions concerning access will begin promptly upon approval notice from the USEPA. Every effort will be made to keep the property owner and the USEPA informed of any changes to the work and to the schedule.

   b. Permits. Under Superfund, the Site developer is exempt from obtaining permits from the City of Chicago and Cook County for remediation removal activities conducted on-site, but must obtain permits for portions of the work accomplished off-site. Some permits, particularly those issued by the Department of Transportation to commercial carriers to transport the excavated soils and debris over public streets, will not be sought and, therefore, are not addressed in this Plan. The Site developer will contract only with transportation companies qualified and licensed to carry such materials.

   c. Background Air Monitoring. Unless otherwise waived by the USEPA, monitoring and analyses to be conducted prior to beginning excavation at the Site will provide adequate data to determine a background air quality which can be used for the Site. A description of the air monitoring that will be done is included in the Air Monitoring Plan for the Site including the proposed location for the background sample.

   d. Site Survey. If one is not already available, prior to work at the Site a current site survey will be prepared by a licensed surveyor.

e. Soil Sampling. Soil sampling is described in the Soil Sampling Plan (SOP-214). Background gamma values are developed in accordance with Gamma Radiological Surveys (SOP-210).

f. Utilities. For the Site, "utilities" will include, but not be limited to, natural gas, drinking water, waste water, communications, electrical power distribution, and storm water collection systems. The locations of all utilities will be determined, field located and shown on all maps and drawings for the properties. All work to replace, repair or backfill utilities shall be done as required by the appropriate utility company or agency.

g. Buildings. No buildings are present within the areas proposed to be excavated.

3. Excavation and restoration work includes removing any structures, facilities, landscaping or other appurtenances as necessary, excavating contaminated soils, cleaning contaminated buildings, facilities, structures, utilities and appurtenances, verifying that radioactivity greater than the cleanup criteria has been removed and backfilling all excavations. Site restoration is not proposed pending site development and construction.

a. Work to remove asphalt pavements, sidewalks, foundations, retaining walls, etc., is described in Section 4.0 of the Work Plan

b. Work to excavate contaminated soils is described in Sections 4.0 and 5.0 in the Health and Safety Plan (HASP) for the Site.

c. The requirements for soil sampling are described in the Soil Sampling Plan.

d. The work for properly backfilling all excavations is included in the Work Plan.

1.2 Related Work

Other Part 1 Sections of these Specifications.

1.3 Definitions

A. Access Agreement refers to a legal document between the Contractor, Property Owner and tenant authorizing the Contractor or the USEPA to complete the excavation and restoration action as described in these Specifications, the Work Plan and the HASP.

B. City refers to the City of Chicago and its representatives.

C. Contract Documents for the work consist of the drawings, these specifications and all addenda issued prior to and all modifications issued after the execution of the contract.

D. Contractor refers to AECOM and its subcontractors and consultants.

E. County refers to Cook County, Illinois and its authorized representatives.

F. USEPA refers to the Region 5 office of the United States Environmental Protection Agency and its representatives.

G. Job Set refers to a complete set of Project Record Documents used during construction activities.

H. Project refers to all activities associated with the excavation and restoration action.

I. State refers to the State of Illinois and its authorized representatives.

J. Utilities. For the project, "utilities" will include, but not be limited to, natural gas, drinking water, waste water, communications, and electrical power distribution and storm water collection systems.

K. Work Order refers to the plans, drawings, additional specifications, directions and agreements prepared for properly completing work at the Site.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.1 Scope of Work

A. The work to be performed includes furnishing all labor, tools, equipment, materials, transportation, services, and incidentals, and performing all operations necessary for the excavation and transportation of radiologically-impacted soils, and the monitoring of those excavations as shown and noted on the drawings and as required in these Specifications.

B. The work includes the decontamination of the Site and the management of excavation and demolition materials in accordance with the Statement of Work. The work included is further described in Article 3.2, Construction Sequence.

3.2 Construction Sequence

Except as specifically noted, the construction sequence described below is intended as guidance for this project. At the discretion of the Contractor, the work may be done simultaneously or in an order other than below, as long as it will not affect the quality, timely completion, or safety of the work.

B. Mobilization

1. Mobilize personnel, equipment, materials, and temporary facilities needed for the project. Provide for electrical, water, communications and other utilities as required for the work.

2. Provide site-specific training for workers. Discuss work with crews, including areas of special concern (construction and radiological), construction schedule and sequence, and health and safety.

3. Prepare the personnel and equipment decontamination facilities.

4. Select areas within the Site for staging soils, containers and demolition materials. Prepare areas as necessary (e.g., berms for temporary water control, or plastic sheeting if on "clean" area)

5. Set up the air monitoring system and begin monitoring.

6. Set up traffic controls, as required.

C. Contamination Excavation

1. Excavation of contaminated buildings is not anticipated.

2. Excavation of contaminated soil will occur using these steps:

a. Do construction staking or marking (additional surveying, as necessary, for horizontal and vertical limits of soil excavation). These limits will be based on the previous AECOM site investigation reports.

b. As necessary, lock-out, tag-out, and/or shut down all utilities which could affect or be affected by the work. Purge, decontaminate and otherwise properly manage utilities so they can be removed, protected from damage, or relocated, as necessary.

c. Excavate the contaminated soils on the property and transport them to the disposal facility. Stockpile soils on the Site only as necessary.

d. Do soil sampling and gamma surveying to determine if additional excavation is necessary. Excavation will not extend below groundwater.

(i) If necessary, do construction staking. Continue excavating until surveying and sampling indicate all contaminated materials have been removed.

(ii) Notify the USEPA that pre-verification sampling has been completed and request verification surveying and sampling, and if found to meet the closure standard, request approval to backfill.

D. Restoration

1. Restoration is not proposed for the Site. Minimal restoration may consist of flattening the slopes of the excavations. The Site will be regraded in preparation for construction and development.

3.3 Disruption

A. The contractor will, to the extent practical, use his best efforts to undertake the project in a manner that avoids unnecessary disruption of local businesses and their customers or tenants.

3.4 Work Quality Control

A. Shop and field work shall be performed by personnel thoroughly trained and experienced in their field of expertise. Work on this project shall be performed in accordance with the best practices of the various trades involved.

B. Quality control inspections will be conducted for all construction activities under these specifications. The inspector will be independent of the work activity being inspected.

C. Work will be certified as having been completed in full satisfaction of these Specifications.

D. Work will be done as required by these Specifications, the Work Plan and other documents referenced in these Specifications.

211 EAST GRAND AVENUE
CHICAGO, IL

Title: Construction Health and Safety

Section 01020

Revision Number: 0

Date: November 5, 2010

Replaces: New

SECTION 01020

CONSTRUCTION HEALTH AND SAFETY

PART 1 - GENERAL

1.1 Scope

A formal Health and Safety Plan (HASP) has been prepared for the work described in these Specifications. This section of the Specifications summarizes the requirements of the HASP as they apply to the construction work, and references those sections of the HASP where detailed descriptions of the health and safety requirements and procedures can be found.

1.2 Related Work

A. Other Part 1Sections of the Specifications
B. Section 02010 - Demolition and Debris Removal
C. Section 02200 – Contaminated Material Loadout and Earthwork
D. Section 02840 - Site Utilities

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.1 Safeguards will be taken to ensure the safety of workers in and around excavations. These will include, but not be limited to, the following:

a. Stairways, ladders, ramps, or other safe means of egress will be located in trench excavations that are 4 feet or more in depth.

b. No persons will be permitted underneath loads handled by lifting or digging equipment. Personnel are required to stand away from any vehicles being loaded or unloaded to avoid being struck by any spillage or falling materials.

c. All trenches and excavations 6 inches or deeper will be marked and guarded for the duration of the project with barricades placed a minimum of 2 feet from the edge of the excavation to prevent persons from falling into the opening.

d. Precautions will be taken to prevent surface or runoff water from entering the excavation. Ditches, dikes, or other effective means will be installed or used to prevent water from entering the excavation and to drain the surrounding areas.

e. Any excavation that meets the definition of a confined space will be treated as such, as defined by OSHA 1910.146, and all applicable procedures detailed in Section 13 of the HASP will be followed. A crawl space or storm cellar area could fall within the definition of a confined space if it: (1) is large enough and so configured that personnel can bodily enter and perform assigned work; and (2) has limited or restricted means for entry or exit; and (3) is not designed for continuous personnel occupancy.

f. All personnel in an excavation greater than four feet in depth will be protected from cave-ins by an adequate protective system. An adequate protective system will include barrier protection (e.g., shoring or trench boxes) or sloping. Other protective measures required by 29 CFR 1926, Subpart P also will be provided.

g. The determination of the angle of repose and design of any supporting system will be based on careful evaluation of pertinent factors such as depth of cut; possible variation in water content of material while the excavation is open; anticipated changes in materials from exposure to air, sun, water, or freezing; loading imposed by structures, equipment, overlying material, or stored material; and vibration from equipment, blasting, traffic, or other sources.

h. Daily inspections of excavations, the adjacent areas, and protective systems will be made and documented by a competent person. The documentation will include indications of potential cave-ins, failure of protective systems, hazardous atmospheres, or other conditions.

i. No employee or any other person will work adjacent to or enter an excavation until the work area has been inspected by the competent person. The inspection will determine if conditions exist which may expose workers to moving ground or any other unsafe conditions. Any deficiencies identified during inspections will be adequately corrected prior to work in excavation.

3.2 Training

1. All persons active in the excavation work at the Site will receive training as specified in Section 5 of the HASP for work with low-level radioactive materials. The training program in Section 5 of the HASP is in accordance with 29 CFR 1910.

2. In addition to the training above, periodic "tailgate" health and safety meetings will be held. The purpose of these meetings will be to discuss deficiencies in health and safety practices, discuss hazards specific to new properties or encountered at existing properties, discuss the results of monitoring, and generally reinforce good health and safety practices. A typical form for such meetings is found in Section 5 of the HASP.

3. Special training shall be provided or required for work such as the following.

   a. Supervisory Work. All supervisors shall have received at least the additional eight hours training required by OSHA.

   b. Truck Driver. All truck drivers shall be instructed in and knowledgeable about the routes to be used between the property and the train station, the requirements of the work (work with and transport of potentially radioactive materials), and the emergency and contingency procedures to be implemented in the event of an accident.

   c. All persons employed in the transport and handling of radioactive materials shall have received HAZMAT training.

   d. A competent person will be on-site for shoring.

3.3. Personal Protective Equipment (PPE) - Based on information obtained from monitoring observation of similar work at vicinity properties, work at this Site can be done in Level D PPE. The Health and Safety Coordinator will evaluate individual tasks and work areas and specify particular types of PPE based on this evaluation. PPE utilized in the performance of the work under these specifications will be in accordance with Sections 7 and 8 of the HASP.

3.4 Hot Work

A. Flame welding and cutting operations

1. Gas bottles shall be properly color-coded, in good condition, and stored in a secured manner in racks or carts. Bottles with corroded or damaged threads will not be used.

2. Regulators shall be in good condition, and suitable for the use.

3. Fuel gas and oxygen hose shall be easily distinguishable and shall not be interchangeable. Hoses shall be inspected at the beginning of each shift and shall be repaired or replaced if defective.

3.5 Transporting Contaminated Materials Over Uncontaminated Areas

A. Transport between the Site and the Rail Terminal

1. Haul routes between the Site and the rail terminal will be defined (see Transportation and Logistics Plan) and all operators will be instructed in the location and use of these routes. Transport of contaminated materials will be over designated routes only.

2. Rolloff containers used to transport contaminated materials over uncontaminated areas will be capable of transporting the material without spillage. Covers will be secured onto the containers prior to exiting the contaminated area. Empty trucks returning to the site will be tarped, as will trucks supplying clean backfill, topsoil, and related construction materials. Tarps will be fastened down tightly to prevent material from being blown out of the trucks.

3. Trucks and rolloff containers used to transport contaminated materials will be frisked and decontaminated if necessary in accordance with Subpart 3.8, below, prior to exiting the contaminated area.

4. Should a truck hauling contaminated material from the Site to the rail terminal accidentally spill any part of its load, the Contractor will direct site workers to assist in the cleanup. Spill cleanup, including proper notification of agencies and authorities, will be accomplished in accordance with the Emergency Contingency Plan.

B. Transport within a Property

1. Haulage routes will be established within the Site and all workers will be instructed in the location and use of these routes. Following excavation and restoration of soils and other materials, such routes will be examined, visually and with radiation detection equipment, for the presence of spilled materials. All spilled materials will be removed.

2. Practices to control spillage will be implemented during excavation and restoration. These practices will include such things as the following:

   a. Not filling haul equipment above the sides of the bed or bucket,

   b. Limiting travel speed, and

   c. Covering haul routes with clean soil or other materials. Such materials would be inspected as above, and decontaminated for reuse or properly transported to the rail terminal for eventual transfer to the approved disposal facility.

3.6 Equipment Decontamination Facilities

A. Equipment Decontamination Station – If necessary, an equipment decontamination station will be made available for the decontamination of vehicles, tools, and equipment, prior to exiting the controlled area. The equipment decontamination station will be located within the secured area, and will include the following:

1. A steam pressure washer for removing contamination from the wheels, tracks, and other surfaces of the equipment and trucks.

B. Release of Construction Vehicles and Equipment for Unrestricted Use - Prior to being released from the Exclusion Zone, all construction vehicles and equipment will be frisked, and decontaminated if necessary. Contaminated vehicles and equipment will be decontaminated using a pressurized water spray in accordance with Subpart A, above. Water generated during the decontamination activities will be evaporated, infiltrated within the Exclusion Zone, used for dust control, or collected and stored on the Site for other purposes or eventual disposal.

3.7 Dust and Water Runoff Control

A. Dust control measures used during work activities on the Site may include, but are not limited to the following:

1. *Using hoses with mist or fog nozzles to spray light applications of water over the areas of* excavation or demolition, staging, loadout, and dumping/storage. The Contractor will be responsible for the control of excess water.

2. Minimizing travel over soil areas. Some travel over contaminated soils (e.g., by excavation equipment and by haul trucks) may be necessary. Dust minimization procedures will include, but not be limited to, the following.

   a. Within the property, the speed limit for trucks and excavation equipment will be fifteen miles per hour.
   b. *Areas which will be used extensively as travelways (e.g., entrances to and exits* from equipment decontamination facilities) will be sprayed with water as necessary to control dust.

3. Storage and staging piles will be covered when not in use.

B. Runoff water control measures on the Site may include, but are not limited to the following:

1. Excavation of temporary swales, ditches, and/or retention ponds.

2. Construction of temporary diversion dikes and berms.

3. Pumping of water to runoff water control facilities. Water removed from contaminated excavations will be evaporated, used for dust control, or collected and stored on the Site.

3.8 Contingency Plans and Emergency Response Procedures

Contingency plans and emergency response procedures for Site activities are provided in the Emergency and Contingency Plan. These plans and procedures will be followed in the event of an emergency situation arising from the work activities or acts of God that may affect the environment or human health and safety.

211 EAST GRAND AVENUE
CHICAGO, IL

Title: Demolition and Debris Removal

Section 02010

Revision Number: 0

Date: November 5, 2010

Replaces: New

SECTION 02010

DEMOLITION AND DEBRIS REMOVAL

1.0 GENERAL

1.1 Scope

A. This section describes excavation requirements for existing Site features, including:

1. Salvage Disposition, Storage, and Handling of Property.
2. Demolition of Existing Site Features.
3. Sawcutting.
4. Debris Segregation, Decontamination, Haulage, Storage, and Disposal.
5. Matching and Patch Repairing.

B. Descriptions for radiological surveying are specified in the Work Plan, Appendix F (Verification Sampling Plan)

1.2 Related Work

A. Part 1 Sections of these Specifications.

B. Section 02840 - Site Utilities

1.3 Salvage Disposition. Storage and Handling of Property

A. Remove all structures, equipment, facilities, materials and other items called for in the Work Plan or that otherwise must be removed to access the work areas and store as directed. Such items shall be removed completely, including appurtenances, and shall be properly protected.

B. All non-radiologically-impacted materials, equipment, and other items permanently removed from the work area for the proper completion of the excavation work shall be properly managed and/or disposed as applicable.

1.4 Submittals

A. All submittals shall be made to the AECOM Project Manager.

B. Submit landfill tickets for all uncontaminated debris disposed offsite, no more than five days after disposal, except where dumpsters are emptied directly into collection trucks. The use of dumpsters will be recorded in the field logbook. Each ticket shall contain at least the information below.

1. Date of disposal
2. Estimated volume or weight of load if required by the designated measurement method of the landfill.
3. Description of materials disposed.

4. Name of wastehauling subcontractor.

1.5 Health and Safety Conditions of the Work

In addition to the hazards common to demolition, radioactive materials are known to be present at this Site, and may be present in or on slabs/paving, structures, facilities and utilities.

A. Detailed health and safety requirements for work on the vicinity properties are included in Section 01020 of these Specifications and the HASP.

B. All demolition work will be done as required by OSHA regulations published in 29 CFR 1910 and 1926. These regulations are included by reference in these Specifications.

C. Based on existing information, excavation work can proceed under Level D personal protection conditions (see HASP). Air and soil monitoring and sampling will be done during the conduct of the work to determine if modifications to Level D work conditions are necessary.

1. The Contractor shall be prepared to discontinue work in an area and begin work in an alternate area if monitoring and sampling indicate changes in the work conditions may be necessary and if so directed by the AECOM Project Manager, AECOM Field Team Leader, or their Agent.

2. The Contractor shall be prepared to begin working under changed conditions (greater than or equal to Level D personal protection with appropriate personal, equipment and vehicle decontamination) with minimal delay. Additional requirements which may be necessary if asphalt, concrete, wood, metal or other construction materials containing hazardous materials or levels of radiation above background are encountered are discussed in Section 01020 of these Specifications.

D. The Quality Assurance Supervisor, Field Team Leader, or Health and Safety Coordinator may bar from the Site any person or persons who shows a disregard for health and safety of themselves or others.

1.6 Permits

A. The Contractor shall be responsible for obtaining all permits required for the work and additions described in this section of these Specifications.

B. Copies of all the necessary permits shall be provided to the Project Quality Assurance Supervisor prior to beginning the work.

C. At a minimum, all work shall be done in accordance with the requirements of the permits. The requirements of these permits are included by reference in these Specifications. Where the requirements of the permits and these Specifications are in conflict, the more stringent requirements shall apply.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.1 General

A. The work performed under these Specifications shall be done as indicated in this Work Plan, specified herein, and as required by the permits and the laws, rules and regulations of the City of Chicago, the State of Illinois and the USEPA.

B. The Contractor shall remove existing property features as indicated in the Work Plan and shall perform demolition in a manner to allow segregation and proper disposal of contaminated and uncontaminated material. The Contractor must use methods and operations which will minimize the potential for the spread of contamination.

C. It shall be the Contractor's responsibility:

1. To maintain adequate safety measures and working conditions (see Section 01020 of these Specifications and the HASP).

2. To take all measures necessary during the performance of the work to protect the entire project area and adjacent properties which would be affected by this work from storm damage, flood hazard, caving of trenches and embankments, and sloughing of material, until final acceptance by the AECOM Project Manager, AECOM Field Team Leader, or their Agent.

3. To maintain completed areas until the entire project area is in satisfactory compliance with the Specifications.

3.2 Structure Demolition

A. General

No structures are present on the site, where excavation is proposed.

B. Foundations

1. The methods used to demolish and remove foundations shall be at the discretion of the Contractor, as long as the requirements of these Specifications, the permits, and the laws, rules and regulations of the City, County, State, OSHA or the USEPA, whichever are more stringent, are met.

2. All demolition of foundations shall be done in a manner to minimize disturbance of the surrounding and underlying soil. This could include, but not be limited to, pre-breaking or sawing the foundation elements, and the measures described in Article 3.3 of these Specifications.

3. Concrete, rock or block foundations may be demolished and reduced in size as described in the foregoing subpart.

4. Foundation walls which serve as retaining walls to support earth or adjoining structures shall not be demolished until such earth has been properly braced, or adjoining structures have been underpinned to prevent movement. Bracing and shoring shall be evaluated and, if necessary, designed by a qualified Professional Engineer.

5. Adjacent foundation walls and "party" walls to a basement, which are to serve as retaining walls against which fill or debris will be placed, shall be checked for structural strength before they are to be so used. Evaluations and, if necessary, designs of shoring and bracing shall be done by a qualified Professional Engineer.

6. Foundations and basement floor slabs will be removed to verify conditions beneath them. The concrete, if not contaminated, will be staged on-site for later removal or will be removed as clean debris. Concrete found to be impacted will be decontaminated in accordance with SOP-345. If decontamination cannot be reasonably completed, the concrete will be reduced in size sufficient to be managed as impacted and loaded for off-site shipment and disposal.

C. Retaining Walls

1. The methods used to demolish and remove retaining walls shall be at the discretion of the Contractor, as long as the requirements of these Specifications, the permits, and the laws, rules and regulations of the City, County, State, OSHA or the USEPA, whichever are more stringent, are met.

2. All demolition of retaining walls shall be done in a manner to minimize disturbance of the surrounding and underlying soil. This could include, but not be limited to, pre-breaking or sawing the pavement and slabs, and the measures described in Article 3.3 of these Specifications.

3. Shoring or bracing may be necessary during the demolition of retaining walls. Shoring or bracing shall be designed by a qualified Professional Engineer, competent in soils. Shoring and bracing designs shall be submitted to the Respondents or their Agent and the Field Team Leader prior to beginning excavation where their use may be necessary.

4. Concrete, rock or block foundations may be demolished and reduced in size as described in the foregoing subpart.

3.3 Sawcutting

A. The Contractor shall be responsible for all sawcutting necessary for the excavation of contamination whether described in the Work Plan or not. The Contractor shall sawcut concrete, masonry, asphalt paving, and other work as needed, observing the following requirements:

1. The Contractor shall provide liquid or other dust control for all sawcutting of contaminated materials or materials overlying contaminated materials.

2. Finished vertical concrete or masonry cuts shall be made using a track-mounted concrete saw. The finished cut shall be a minimum of three inches deep, in a straight and true line.

3. Finished horizontal concrete or masonry cuts shall be made using a cradle-mounted concrete saw. Make the finished cut a minimum of three inches deep, in a straight and true line.

4. Where portions of masonry will be removed and replaced, masonry excavation and restoration shall be along mortar joints so the finished wall will have the same masonry pattern as the existing.

5. Finished asphalt paving cuts shall be made using an asphalt blade in a cradle-mounted saw. The finished cut shall be a minimum of two inches deep, in a straight and true line.

6. If a clean break cannot be made where new concrete will be replaced against old concrete, provide sawcutting necessary to produce clean edges on the existing concrete.

3.4 Decontamination of Items

A. Some contaminated items such as slabs, pavement, and piping, can be decontaminated and disposed in industrial or other landfills. Decontamination of items will include removing the

contaminated dust, dirt or encrustations from the surfaces of the items. Decontamination may be accomplished by high-pressure spraying, or manually removing contaminated materials with brushes, soap and water, rags, and miscellaneous hand tools until the items are verified as *radiologically suitable for the proposed disposal.*

B. Decontamination of contaminated equipment, tools, materials and supplies is described in detail in SOP-347 Decontamination.

3.5 Contaminated Material Loadout and Transport

A. General Requirements

1. Before beginning contaminated material loadout operations, the Contractor shall construct temporary site drainage facilities, and if necessary, initiate dust control measures. The Contractor also shall construct all decontamination and loadout facilities and establish survey controls.

2. The Contractor shall use equipment and methods that minimize the potential for spillage of materials during loading operations.

3. At a minimum, the loadout shall be cleaned (liquid and nonliquid wastes removed) at the end of every other day. Spilled materials shall be promptly removed from the loading facility if the quantity is such that the material could be picked up and transported out of the loadout facility.

4. All decontamination of equipment shall be done as required herein and by SOP-347 Decontamination.

5. In no case shall equipment with radioactivity above the release levels be allowed to leave the Site.

B. Loadout

1. All loadout of material will be done as required by these Specifications and the Work Plan. Loading of trucks and other containers with contaminated soil or debris shall be done only in the loadout or equipment decontamination areas.

2. Contaminated soils and debris will be loaded directly into containers as they are excavated, and the container staged in a clean area for pickup and transport. Materials will be placed so they do not extend above the sides of the container. Materials protruding above the sides of the container will be pushed down or removed for placement into another container. If isolated quantities of impacted soil are encountered in volumes less than necessary to fill a container, the material will be placed in Supersacks and stored temporarily until there is sufficient material accumulated to fill a container.

3. Rolloff containers will be secured with lids.

4. Drivers shall remain inside the truck with the windows closed or shall exit the truck prior to loading.

C. Decontamination

1. Detailed requirements for the decontamination of trucks and containers are provided in SOP-347 Decontamination.

2. Following loading in the loadout area, and decontamination if such is necessary, all trucks and containers will be frisked.

3. If frisking shows such is necessary, trucks and containers will be decontaminated by wiping or spraying.

4. Trucks and containers need a final survey prior to unrestricted release from the loadout.

D. Transport

1. Trucks picking up and dropping off containers at the staging areas outside of the loadout need not be decontaminated unless a container spill has occurred.

2. Trucks shall only use the designated route(s) to transport materials from the Site to the rail terminal, and shall obey all signs, speed limits and other traffic laws. Any driver not obeying traffic laws, or the requirements of these Specifications, shall be removed from the work.

3. All trucks shall properly display decal with all information required for transport of contaminated materials.

4. Each truck shall carry the standard industry bill of lading for each shipment to the rail terminal.

5. All truck drivers shall have the training required by 29 CFR 1910.120 and shall be trained in the procedures to be used in the event of an emergency, as described in the Emergency Contingency Plan.

3.6 Storage

A. All storage or stockpiling of materials shall be done as required by Section 02200 of these Specifications and described in the Work Plan.

B. On the Subject Site

1. Non-radioactive materials, including fill, may be temporarily stockpiled (staged) on the Site in the locations noted in the Work Plan, or as approved or directed by AECOM or its Agent.

   a. As necessary, staged non-radioactive materials shall be covered or otherwise managed to control dust.

2. Radioactive materials may be staged on the Site only with written approval from the USEPA and approval by the AECOM Project Manager.

   a. Radioactive materials shall only be stored on contaminated or specially prepared areas to minimize the potential for contamination of "clean" areas.

   b. All excavated radioactive materials shall be containerized by the end of the day. If isolated quantities of impacted soil are encountered in volumes less than necessary to fill a container, the material will be placed in Supersacks and stored temporarily until there is sufficient material accumulated to fill a container.

   c. Except when work is actively in progress, the staged contaminated materials that are not containerized shall be stored temporarily in Supersacks on-site. Radiologically-impacted material that cannot be placed in containers for overnight storage will not be excavated.

C. On the Rail Terminal Site

1. If radiologically-impacted materials will be transported by rail for disposal, the loaded and tarped containers will be stored at the rail terminal temporarily until the appropriate train is loaded and dispatched to the permanent disposal facility.

3.7 Disposal

A. At a minimum, all materials shall be disposed as required by the permits, these Specifications, and the laws, rules and regulations of the State of Illinois or the USEPA, whichever are more stringent. All materials to be disposed shall be surveyed as required by SOP-345 to determine they are suitable for the intended disposal method and location.

B. If clean materials are disposed by landfilling or recycling, the Contractor shall provide the AECOM Project Manager and the Field Team Leader with the name of the landfill or recycler.

1. The landfill or recycler must be qualified to receive the waste. The landfill or recycler must provide the Contractor with qualification information.

2. The AECOM Project Manager or its Agent has the right to reject any landfill which does not meet qualification standards.

3.8 Cleanup

Upon completion of work in this section, all rubbish and debris shall be removed from the job site. Soils or fill materials that were excavated from the site and were determined not to exceed the radiological cleanup standard of 7.1 pCi/g total radium (Ra-226 + Ra-228) may be used or redeposited on the site as fill material. All construction equipment and implements of service shall be removed and the entire area involved shall be left in a neat, clean and acceptable condition.

211 EAST GRAND AVENUE
CHICAGO, IL

Title: Contaminated Material Loadout and Earthwork

Section 02200

Revision Number: 0

Date: November 5, 2010

Replaces: New

SECTION 02200

CONTAMINATED MATERIAL LOADOUT AND EARTHWORK

PART 1 - GENERAL

1.1 Scope

A. General

1. Descriptions of the landscaping, structures, etc. for the Site are included in the Work Plan of which these Specifications are a part.

1.2 Related Work

A. Part 1 Sections of these Specifications

B. Section 02010 - Demolition and Debris Removal

D. Section 02840 - Site Utilities

1.3 Site Investigation

A. Investigation Reports

Investigation reports included in the Appendices may be used as a guide to conditions on this project as they contain boring summaries and related information depicting surface and subsurface conditions at specific locations at the Site. Surface and soils conditions at other locations may differ from conditions occurring at the boring locations. Therefore, further investigations will be done prior to and during the excavation activities.

B. Contractor's/Subcontractor's Responsibility

The Contractor/Subcontractor shall carefully examine the Site and make all inspections necessary in order to determine the full extent of the work. The Contractor/Subcontractor shall satisfy himself as to the nature, location and conditions of the work, the conformation and condition of the existing ground surface, and the character of equipment and facilities needed prior to and during prosecution of the work. The Contractor/Subcontractor shall satisfy himself as to the character, quality, and quantity of surface and subsurface materials or obstacles to be encountered. Any inaccuracies or discrepancies between the actual field conditions and the Work Plan, or between the Work Plan and Specifications, must be brought to the attention of the Project Coordinator in order to clarify the exact nature of the work to be performed.

1.4 Health and Safety

A. Detailed discussions of the potential hazards and the requirements for minimizing the potential for harm to project and offsite personnel, and to the environment, are provided in Section 01020 and Section 1.5 of this section of these Specifications.

B. All work shall be done under the supervision of personnel experienced and qualified for the work.

C. All work will be done as required by OSHA regulations published in 29 CFR 1910 and 1926. These regulations are included by reference in these Specifications.

D. Based on preliminary results, sampling and analyses of soils from the Site indicate levels of radioactivity in the soils above background levels. Based on the sampling and surveys, the work can proceed under Level D personal protection conditions. Air and soil monitoring and sampling will be done during the conduct of the work to determine if modifications to Level D work conditions are necessary (see Sections 01020 and 02010 of these Specifications). A complete description of health and safety requirements for this site is provided in the Health and Safety Plan (HASP) for this project.

1. The Contractor shall be prepared to discontinue work in an area and begin work in an alternate area if monitoring and sampling indicate changes in the work conditions may be necessary and if so directed by the Respondents or his Agent.

2. The Contractor shall be prepared to begin working under changed conditions (greater than or equal to Level D personal protection with appropriate personal, equipment and vehicle decontamination) with minimal delay. The requirements which may be necessary if asphalt, concrete, wood, metal or other construction materials containing levels of radiation above background encountered are discussed in Section 02010 of these Specifications.

E. The Field Team Leader or Health and Safety Coordinator may bar any person from the site who, in their opinion, shows a disregard for health and safety requirements.

1.5 Environmental Safeguards and Regulations

A. The Contractor shall comply with all federal, State, and local regulations, and the requirements of these Specifications at all times to prevent pollution of air, water and soil.

B. The Contractor will preserve and protect all structures, equipment, and vegetation (such as trees, shrubs and grass) on or adjacent to the work area, which is not to be removed and which does not unreasonably interfere with the excavation or restoration work. The Contractor will only remove trees when such is required by the Work Plan and will avoid damaging vegetation that will remain in place. Limbs or branches of trees broken by the contractor will be trimmed with a clean cut, and the cut painted with a tree-pruning compound.

C. The Contractor will control air and water pollution as described in these Specifications and the Work Plan.

1.6 Permits

A. The Contractor shall be responsible for obtaining all permits required for the work and additions described in this section of these Specifications.

B. Copies of all the necessary permits shall be provided to the Project Quality Assurance Manager prior to beginning the work.

C. At a minimum, all work shall be done in accordance with the requirements of the permits. The requirements of these permits are included by reference in these Specifications. Where the requirements of the permits and these Specifications are in conflict, the more stringent requirements shall apply.

1.7 Submittals

A. All submittals shall be made to the Respondents or their Agent, with copies submitted to the Field Team Leader.

B. The Contractor shall maintain a log of those submittals directed by the Respondents.

C. Import Backfill Materials

1. The Contractor will submit a list showing materials expected to be imported, and the name(s) and locations of the supplier(s) of each type of material.

2. Submit analyses such as radioactivity, geotechnical, gradation, and proctor test results of backfill materials, and certification of conformance with material specifications as determined by the testing consultant for each material, in accordance with testing per Section 2.E of this specification.

3. The above information shall be submitted with the Work Plan for the Site for each source, prior to use.

D. Imported Backfill Material Truck Tickets

1. Submit imported backfill material truck tickets no less than five days prior to submittal of application for payment of the applicable items of work. Minimum required information on truck tickets includes the following.

   a. Date of delivery.
   b. Material description.
   c. Truck identification number or license number.
   d. Gross weight and tare weight or volume of load.
   e. Supplier name/source.
   f. Signatures of scale operator and truck driver.

2. Truck tickets without the above information will not be accepted for payment.

E. Soil Compaction Test Report

1. Submit soil compaction test reports indicating test results from the testing consultant. The Contractor shall be prepared to provide preliminary test results within 24 hours of the test. Final test results shall be submitted to the Contractor and available for review within seven days of testing.

2. Test results shall include time and date of test, test methodology, location of test, name of person and firm conducting the testing, and any pertinent information which may affect the test results.

1.8 Definitions

A. Excavation. Excavation is defined as reaching the lines, grades, elevations and contamination depths shown in the Work Plan or determined by in-place monitoring. Excavation of uncontaminated topsoil, silt, clay, sand, gravel, talus, soft or disintegrated rock, boulder or detached pieces of soil rock or debris shall be included, as well as excavation of contaminated material. During the excavation work, monitoring of radiological contamination of the excavated material will be done by the Respondents.

B. Contaminated Soil

1. Soil which must be excavated, transported, or disposed under special conditions. Soil from these sites may have levels of radioactivity above background. Determining the vertical and horizontal extent of contaminated soil will be the responsibility of the Respondents.

2. Soils containing concentrations of Ra-226 plus Ra-228 greater than five picoCuries per gram (5 pCi/g) of dry soil above natural background averaged over six-inch thick layer are considered radioactively contaminated.

C. Salvaged Excavation Materials Uncontaminated soil materials from designated areas of the Site suitable for use as common or structural fill which are not otherwise classified as unsatisfactory (see Part 2 of this Section). Unless otherwise directed by the Work Plan or the Respondents' Agent, salvaged excavation materials shall be used to backfill designated onsite excavations a minimum of six inches below finished grade.

D. Overexcavation. Excavation of any type of material in excess of the lines, grades or depths indicated in the Work Plan or beyond the limits defined by the Work Plan or Specifications.

E. Unsatisfactory Fill Materials Unsatisfactory materials for fill include, but are not limited to, materials containing organic matter, trash, debris, frozen materials, materials containing radioactivity or other hazardous contaminants in excess of regulatory standards, and materials not meeting the criteria of Part 2 of this section. Materials which are unsuitable due to excessive or insufficient moisture or gradation may be used if they can be brought into compliance with the requirements of Part 2 of this section by screening, manipulation, aerating, watering, or blending with other suitable materials. Unsatisfactory fill materials shall not be used.

F. Percent Maximum Density. Percent maximum density is a percentage of the maximum density at optimum moisture obtained by the appropriate test procedure.

G. Stockpile Construction. Stockpile construction is defined as construction of a stabilized fill which will serve as a temporary storage stockpile constructed of contaminated or uncontaminated materials.

H. Subgrade Preparation Subgrade preparation includes fine grading, scarification and compaction, of existing ground, upon which additional materials will be placed.

1.9 Applicable Publications.

The publications listed below form a part of these Specifications to the extent referenced. The publications are referred to in the text by the basic designations below.

1. American Society for Testing and Materials standard methods of testing. Hereinafter designated as ASTM. The letters and numbers following ASTM (e.g., D698) refer to a particular test.

2. Standard Specifications for Road and Bridge Construction, Illinois Department of Transportation. Hereinafter referred to as State Specifications.

3. Standard Specifications for Water and Sewer Main Construction in Illinois, Fourth Edition.

4. City of Chicago Zoning Ordinances.

1.10 Quality Assurance

A. The Respondents shall make available soil-testing services, either through its own forces or through a soils-testing consultant. The Respondents shall be responsible for taking soil samples and performing moisture-density, gradation, and other tests to ascertain the completed work is in compliance with these Specifications. Samples may be taken at the place of excavation, stockpiles, or from the fill itself. The Respondents shall conduct density and other tests on the fill

as required by these Specifications. The Contractor shall assist the Respondents as necessary to enable sampling and testing.

B. The Field Team Leader shall be a person qualified and experienced in the work described in these Specifications.

C. By Contractor/Subcontractors

1. All work shall be done under the supervision and control of experienced and qualified personnel, competent in the areas of expertise required for the work described in these Specifications and other documents.

2. The Contractor, at his discretion, may have such tests and inspections as he may desire performed by other qualified personnel or independent testing services, for his guidance and control of the work. The cost for such tests and inspections shall be borne by the Contractor. The Quality Assurance Supervisor will consider the results of such testing in determining whether work has been properly done, but the approval of work shall be made by the Respondents or their Agent.

D. Applicable Criteria. Tests and Standards

1. For Excavation of Radioactive Soils. Detailed descriptions of the testing methods and equipment for radioactive soils are described in the Verification Sampling Plan. All soils containing concentrations of Ra-226 plus Ra-228 greater than five pCi/g of dry soil above background, averaged over a six inch layer, shall be removed.

2. For Disposal of Radioactive Soils. All contaminated soils will be disposed in the manner approved by the USEPA. At present, this is to transport the material to a facility licensed to accept these materials for disposal.

3. For Site Earthwork

a. Except for grading and fill under pavement, slabs or structures, surfaces shall be excavated, or filled or graded to plus or minus 0.2 feet (±0.2') of line, slope and elevation shown in the Work Plan, provided in these Specifications, or as directed by the Project Coordinator or Field Team Leader.
b. Areas under pavement, slab or structures shall be filled and/or graded to t0.1 feet.
c. The Contractor will provide survey control for establishing and maintaining excavation and fill. Cut and fill stakes will be placed as necessary, but at least on 50-foot centers, to control excavation and fill. All surveys required to meet City of Chicago earthwork permit requirements shall be performed by a licensed land surveyor. Other surveying will be done by an experienced line and grade surveyor.
d. Following completion of the work, the Site shall be surveyed to confirm all regrading and reconstruction work has been done to proper line and grade.

4. Compaction

a. Compaction of backfilled common materials shall be to at least 90 percent of maximum density (standard proctor - ASTM D698) for areas not covered by structures, paving or slabs, to at least 95% of maximum density for areas to be covered by paving or slabs, and to at least 95% for areas under structures and utilities.
b. Compaction of backfilled select or structural materials shall be to at least 92% of maximum density (standard proctor - ASTM D698) for areas not covered by structures, paving or slabs, to at least 95% of maximum density for areas to be covered by paving or slabs, and to at least 95% for areas under structures and utilities.

c. Maximum densities and optimum moisture information can be obtained from borrow area operators; if this information is not available, the Contractor shall obtain samples representative of all soils to be used for common backfill and provide them to the Respondents or their Agent for testing. Test samples will be provided before backfilling begins.

5. Compaction Testing shall be done on at least 50-foot centers or at least once per lift. Compaction will be tested and determined by competent personnel using methods such as nuclear density gauges (if proper calibration can be achieved), sand cones, or other methods. Compaction work shall be sufficiently observed and all areas of a lift shall be visually inspected by the Respondents or their Agent and the Field Team Leader so they can state their opinion that areas not tested for compaction have been compacted as tested areas.

6. Soils testing. All soils testing (gradations, liquid limits, etc.) will be done using American Society for Testing and Materials (ASTM) procedures and methods.

7. Cleanup. The Contractor shall remove all rubbish, debris, junk, temporary materials, and any surplus excavated materials from the Site, as directed by the Respondents or their Agent. Excavation and proper disposal of these materials and the restoration of staging and storage areas and temporary roads to the satisfaction of the Respondents or their Agent shall be a condition for final acceptance.

PART 2 - PRODUCTS

2.1 Backfill Materials

A. General - Fill materials shall be obtained from suitable stockpiles or borrow as defined in these Specifications. Materials containing organic (except topsoil), perishable, spongy, frozen, expansive or other deleterious materials shall not be acceptable.

B. Materials for Common Fill shall consist of any material imported or excavated from the cut or other borrow sources that, in the opinion of the Respondents or their Agent, are suitable for use in constructing fills. The material shall contain no rocks or hard lumps greater than four (4) inches in size and shall contain at least 40 percent of material smaller than 1/4-inch sieve opening in size. No material of a perishable, spongy, or otherwise improper nature shall be used in filling.

C. Imported Fill

1. Roadbase materials shall conform to State Specifications Section 704.

2. Crushed Rock or Stone for use as fill shall conform to State Specifications Section 704.01.

3. Fine Aggregate or Sand shall conform to State Specifications Section 703.04.

4. Structural Fill under building slabs, ramps, and stairs shall conform to State Specifications Section 704.04, CA-6 or CA-10.

5. Selected Granular Backfill shall conform to Section 20-2.21 C of the Standard Specifications for Water and Sewer Main Construction in Illinois, FA-1 or FA-2.

D. Material placed within 24 inches of rough grade shall be select material that contains no rocks or hard lumps greater than four (4) inches in size and that swells less than 3% when compacted as hereinafter specified for compacted fill.

E. Soils testing

1. Prior to use, all off-site soil sources shall be tested as follows:

   a. Radioactivity Material must be tested for radioactivity and found to be within background ranges (3.7 pCi/g as established by the USEPA in Tech Memo date March 15, 1995).
   b. Engineering Classification ASTM D2487
   c. Standard Proctor Compaction ASTM D698

2. Provide one series of tests for each 10,000 cubic yards of borrow soil used. At least one series of tests will be obtained from each borrow source to be used.

3. Testing of potential on-site soil backfill is described in the Field Sampling Plan.

PART 3 - EXECUTION

3.1 General

A. The work performed under these Specifications shall be constructed to the lines, grades, elevations, slopes and cross-sections indicated in the Work Plan, specified herein, and/or directed by the Respondents or their Agent. Slopes, graded surfaces, and drainage features shall present a neat uniform appearance upon completion of the work.

B. It shall be the Contractor's responsibility:

1. To maintain adequate safety measures and working conditions.

2. To take all measures necessary during the performance of the work to protect the entire project area and adjacent properties which would be affected by this work from storm damage, flood hazard, caving of trenches and embankments, and sloughing of material, until final acceptance by the Respondents or their Agent.

3. To maintain completed areas until the entire project area is in satisfactory compliance with the Specifications.

C. Utility lines and structures indicated in the Work Plan which are to remain in service shall be protected by the Contractor from any damage as a result of his operations.

1. Where utility lines or structures not shown in the Work Plan are encountered, the Contractor shall report them to the Respondents or their Agent before proceeding with the work.

2. Unless their excavation is necessary to allow work to proceed or as a result of contamination, the Contractor shall bear the cost of repair or replacement of any marked utility lines or structures which are broken or damaged by his operations.

3. All repair work, including backfilling, shall be done as required by the governing utility or agency. The Contractor shall contact the governing utility or agency and determine the requirements for properly completing the work. A description of the requirements may be requested to be provided to the Respondents and the Field Team Leader before any work is done.

3.2 Excavation and Restorations. Clearing and Grubbing

A. Clearing. Clearing consists of the complete excavation of objectionable materials and obstructions above and below the ground surface, including tree stumps, brush, grass, vegetative

matter and other objectionable materials within the project limits. All brush and organic material shall be removed before placing any earth fill unless the earth fill to be placed is topsoil.

B. Grubbing, Grubbing consists of the complete excavation of stumps, including tap roots or lateral roots 1-1/2 inches or more in diameter, and the excavation of brush, grass or weeds to depths below the natural ground as specified herein. Stumps shall be grubbed to a depth of 3 feet and grass or weed shall be grubbed to a depth of 12 inches below the natural ground surface, or to the depths as determined in the field by the Respondents or their Agent at the time of construction.

C. Protection. Existing items not designated to be demolished or removed shall be protected from damage. Any such item damaged by the Contractor shall be restored or replaced immediately at the Contractor's expense.

D. Debris and Surplus Material. All debris and surplus material resulting from clearing, and grubbing shall be removed from the site and properly managed by the Contractor. The requirements for managing concrete and asphalt materials are described in Section 02010 of these Specifications.

3.3 Dust Control

The Contractor shall take all steps practical to control dust arising from the construction activity. Detailed discussions of the requirements and potential methods for controlling dust are described in Appendix A of the Work Plan.

3.4 Control of Drainage Water

A. The Contractor shall control drainage water in the area of construction operations, and control storm water and wastewater reaching the construction area from any source, so that no damage will be done to the work or to the environment. The Contractor shall be responsible for any damages to persons or property on or off the construction site due to such drainage water or to the interruption or diversion of such storm water or wastewater on account of his operations.

B. Surface grading shall be done as may be necessary to prevent surface water from flowing into excavations.

1. Any water accumulating therein shall be removed by pumping or by other approved methods.

2. Any water accumulating in a work area which may be contaminated will be tested prior to disposal. If contaminated, such water will be disposed as directed by the Respondents or their Agent.

3. Any water which is the result of the Contractor's failure to properly control drainage will be removed and disposed at the Contractor's expense.

3.5 Excavation

A. General

1. The locations of surveyed benchmarks and estimated depths of cut for beginning the work are shown in the Work Plan. The Contractor shall be responsible for providing additional staking and surveying, including both horizontal and vertical controls, to ensure the Work is done to the standards of these Specifications. The Project Coordinator and Field Team Leader will be available to assist and advise the Contractor.

2. The Contractor shall perform all excavation necessary or required as shown in the Work Plan, or required by these Specifications or the Respondents or their Agent. The excavation shall include the disposal or stockpiling of all materials of whatever nature encountered, which shall include both contaminated soil excavation and common soil excavation when both are present, and shall include the furnishing, placing, and maintaining of shoring and bracing necessary to safely support the sides of the excavations.

3. If the horizontal and vertical limits of excavation, as determined by radiological testing, are less than shown in the Work Plan, the Contractor shall excavate only those materials necessary to achieve compliance with the standards of these Specifications.

4. If the horizontal and vertical limits of excavation, as determined by radiological testing are greater than shown in the Work Plan, the Contractor shall extend the limits of excavation as necessary to achieve compliance with the standards of these Specifications.

5. Excavated material shall be placed a sufficient distance from the edge of the excavation to avoid cave-ins or bank slides. In no case shall excavated materials be placed closer than three feet to the edge of the excavation.

6. Shoring and bracing, if necessary, shall be designed by a qualified Professional Engineer competent in soils engineering.

7. The work also shall include all pumping, ditching and other required measures for the removal or exclusion of water.

B. Contaminated Soils

1. Interpretation of the Work Plan

   a. The Work Plan indicates the estimated horizontal and vertical extent of a contaminated deposit.
   b. Depths of contaminated and uncontaminated soils indicated in the Work Plan represent the total estimated depth from the ground surface to the base of the contamination. The different depths shown across a given deposit are an indication of how the actual contamination depths might be expected to change throughout a given deposit.
   c. Information in the Work Plan indicates the existing surface cover material. Unless otherwise indicated, the replacement surface cover shall match existing.
   d. All contaminated materials, including clay, silt, sand, gravel, cobbles and boulders, and rock will be excavated. The Contractor shall be prepared to conduct whatever excavation is necessary to remove contaminated materials.

2. Excavation Procedures

   a. If possible, contaminated material shall be removed from outlying areas and boundaries of contaminated areas, working toward the equipment decontamination and loadout facilities, to minimize the potential to contaminate "clean" areas.
   b. Truck or container loading shall be done only on ground contaminated and designated for cleanup or on the equipment decontamination pad or other area specially prepared for such work. Care should be taken to avoid spilling during loading.
   c. Contaminated (see Subpart 1.8, B, Definitions of this section) and uncontaminated soils shall be separated during excavation and kept separate during loading, transport and stockpiling to minimize the potential for cross-contamination.

d. Excavations shall be performed carefully to minimize the potential for mixing with underlying soils. Also, cleated or crawler-type equipment shall not be allowed without prior approval of the Respondents or their Agent.
e. Excavations will be radiologically monitored and surveyed by the radiologic technicians to determine if additional material must be removed. Detailed descriptions of the radiological monitoring requirements during excavation are provided in applicable SOPs.
f. The Contractor shall excavate contaminated and uncontaminated soil to within three inches of the design or estimated depth. From this point, excavation should proceed in no greater than six-inch lifts to the depths indicated in the Work Plan. After excavation of each lift, the Respondents will radiologically monitor the excavation and delineate additional excavation required (see the Field Sampling Plan).
g. Exceptions to these requirements must be approved in writing by the Respondents or their Agent and provided to the Field Team Leader. The Contractor will not be paid for removing extra quantities resulting from a deviation from the above requirements, unless a specific deviation has received prior written approval.

D. Other

Uncontaminated material, including clay, silt, sand, gravel, cobbles and boulders and rock, may need to be removed for slopes on excavations, to expose contaminated soils, structures or facilities, or to facilitate work to remove contaminated soils, structures or facilities. Common materials removed from such areas may be used for backfill if they meet the requirements for fill material. If unsuitable, they shall be removed, transported and disposed as surplus excavation.

3.6 Contaminated Material Loadout and Transport

A. General Requirements

1. Before beginning contaminated material loadout operations, the Contractor shall construct temporary site drainage facilities and initiate dust control measures. The Contractor also shall construct all decontamination and loadout facilities and establish survey controls.

2. The Contractor shall use equipment and methods that minimize the potential for spillage of materials during loading operations.

3. At a minimum, the truck loadout shall be cleaned (liquid and nonliquid wastes removed) at the end of every day. Spilled materials shall be promptly removed from the loading facility if the quantity is such that the material will be picked up and transported out of the loadout facility (e.g., dirt clods which could stick to tires).

4. All decontamination of equipment shall be done as required by Section 01020 and this section of these Specifications.

B. Loadout

1. All debris, such as concrete, asphalt, etc., shall be managed as described in Section 02010 of these Specifications.

2. All loadout of material will be done as required by these Specifications and the Work Plan prepared by the Contractor. Loading of trucks and other containers shall be done only in the loadout or equipment decontamination facilities.

3. Unless staging areas have been selected by the Contractor and approved by the Respondents or their Agent, soils and debris will be loaded directly into trucks or containers as they are excavated, for transport to the rail terminal. Materials will be placed so they do

not extend above the sides of the truck bed or container. Materials protruding above the sides of the truck or container will be pushed down or removed for placement into another truck or container by loading equipment or personnel.

4. Truck beds and containers will be tightly covered with tarps.

5. Truck drivers will generally not enter the Contamination Reduction Zone, but shall remain inside the truck when such entry is required.

C. Decontamination

1. After a truck or container has been loaded and tarped, it will be checked for contamination. The truck tires, body and outside of the bed and the outside of the container will be frisked to determine if contaminated soils are present. If frisking does not detect any contamination, the equipment may be released for travel.

2. If frisking does detect contamination the truck or container will be decontaminated by wiping or spraying.

3. Following decontamination, all trucks and containers shall be frisked for release. If any radioactivity above release levels (see Table 02200-1 at the end of this section) is found, decontamination of those areas will be continued. If spraying or wiping is ineffective in removing contamination, brushes or other means shall be used until release levels are achieved. In no case shall a truck or container with radioactivity above the release levels be allowed to leave the site.

4. After containers are loaded and frisked for release, they- shall be staged in a clean area on the site. The trucks used to transport the containers to the rail yard will not need to be frisked prior to leaving the site, as long as the transport trucks do not enter the Contaminant Reduction Zone.

D. Transport

1. Trucks shall use only the designated route(s) to transport containers with contaminated materials from the Site to the rail terminal, and shall obey all signs, speed limits and other traffic laws. Any driver not obeying traffic laws, or the requirements of these Specifications, shall be removed from the work.

2. All trucks shall properly display a decal with all information required for transport of contaminated materials.

3. Each truck shall carry the standard industry bill of lading for each shipment.

4. All truck drivers shall have the training required by 29 CFR 1910.120 and shall be trained in the procedures to be used in the event of an emergency (see Section 01020, Articles 3.2 and 3.7, of these Specifications, and the Emergency Contingency Plan).

3.7 Fill

A. General

1. Unless otherwise specified, fill material shall be compacted by the Contractor to a density that is not less than 90% of the maximum density, standard proctor (ASTM D698).

2. The upper 18 inches of fill material placed in lawns and other areas to be revegetated shall not be compacted beyond that density needed to provide a stable land surface.

3 In areas where contaminated materials have been removed, the Contractor shall not begin backfilling until a radiological survey has been completed and sign-off has been obtained from the USEPA.

4. All fill shall be final graded to the requirements of Part 1 of this Section. After backfilling is completed, the fill (including topsoil) shall be graded to blend with existing contours where future construction will not be done.

B. Preparing Areas to be Filled

1. All vegetable matter and coarse material which might prevent compaction shall be removed by the Contractor from the surface upon which the fill is to be placed. Any loose and porous soils shall be removed or compacted to a depth specified by the Respondents or their Agent. The surface shall then be plowed or scarified until the surface is free from uneven features that would tend to prevent uniform compaction by the equipment to be used.

2. Where fills are constructed on hillsides or slopes, the slope of the original ground on which the fill is to be placed shall be stepped or keyed by the Contractor. The steps shall extend completely through the soil mantle, if any, and into the underlying formation materials.

3. Fill shall not be placed on ground which has frozen, unless the ground can be worked (e.g., scarified and recompacted) to remove the frost.

C. Placing and Spreading Fill Material

1. The Contractor shall not commence backfilling until a radiological survey of the excavation has been completed which verifies all contaminated materials have been removed as required by these Specifications, and the Field Team Leader has provided the Contractor with verbal authorization to begin backfilling.

2. Fill shall be placed to the line, elevation and grade as required by these Specifications, shown in the Work Plan, or described or shown in the Contractor's Work Plan for this Site. Unless otherwise approved in writing by the Respondents or their Agent, the Contractor shall use fill stakes to guide backfilling.

3. Salvaged soil materials shall be used for backfilling unless determined unsuitable by the Respondents or their Agent.

4. When conditions require that contaminated soil will be left in place, backfill will be placed against contaminated soils. In this situation, a six mil polyethylene barrier will be placed to mark the separation between the soils and to minimize the potential for contaminated soils to fall into the "clean" area. Care will be taken during subsequent operations to prevent contaminated soils from mixing with "clean" soils.

5. Fill material to be compacted shall be placed by the Contractor in one foot , even, continuous layers. Each layer shall be spread evenly and shall be thoroughly mixed during the spreading to obtain uniformity of material in each layer.

6. Uniform moisture distribution in the fill to be compacted shall be obtained by discing, blading or other approved methods prior to compaction of a layer.

a. When the moisture content of the fill material is insufficient to achieve specified density requirements, water shall be added by the Contractor until the moisture content is as specified.
b. When the moisture content of the fill material is too high to achieve specified density requirements, the fill material shall be aerated by the Contractor by blading, mixing, or other satisfactory methods until the moisture content is reduced.

7. Unless otherwise shown in the Work Plan, the Contractor shall maintain a minimum of 10 feet of separation between excavation of contaminated soils and placement of clean fill.

8. Fill on City of Chicago street rights-of-way shall be done as required by City of Chicago Standard Specifications.

D. Compaction

1. After each layer has been placed, mixed and spread evenly, it shall be thoroughly compacted by the Contractor to the required density (see below).

2. Compaction shall be accomplished by sheepsfoot rollers, vibratory rollers, multiple-wheel, pneumatic-tired rollers or other types of acceptable compacting equipment.

a. Selection of compaction equipment will be at the discretion of the Contractor. Equipment shall be of such design that it will be able to compact the fill to the specified density.
b. In areas not accessible to or suitable for larger self-propelled roller or vibratory equipment (e.g., small areas, within 12 inches over the top of utilities, etc.), the maximum loose-layer thickness will be four inches.
c. Compaction shall be continuous over the entire area and the equipment shall make sufficient passes over the material to ensure that the desired density has been obtained over the entire area.
d. The surface of fill slopes shall be compacted so that the slopes are stable and there shall be no excessive loose soil on the slopes.

3. Roadbase backfill shall be compacted to at least 95% of maximum density (ASTM D698 - standard proctor).

4. Common backfill shall be compacted as follows:

a. To at least 90% of maximum density (ASTM D698 - standard proctor) for all areas except as noted below.
b. To at least 95% of maximum density (ASTM D698 - standard proctor) for all areas to be covered with paving.
c. To at least 95% according to ASTM D698 in City of Chicago street right of-ways where asphalt will be placed, except for the upper six-inch layer which will be compacted to not less than 100%.

5. Structural fill under buildings, slabs, ramps and stair shall be compacted to at least 95% of maximum density (ASTM D698).

6. Compaction will not be required in the upper 18 inches of soil placed in lawns or other areas to be revegetated.

E. When an area has been prepared to receive concrete or asphalt, applicable moisture and density requirements shall be maintained in the upper layer until the surface construction is completed.

F. The Contractor shall provide and maintain adequate erosion and drainage control facilities during the construction of the fill areas. The erosion control facilities shall be maintained in optimum condition until the work is complete. The facilities shall be inspected following significant rainfall, repairs made and excess sediment removed. It shall be the Contractor's responsibility to prevent the discharge of sediment offsite or to adjacent water courses.

G. Backfill around Utilities. In any case where utilities are disturbed or exposed, all repair work shall be done in accordance with the requirements of the utility, or the governing agency (see Appendix G - Specification 02840 Site Utilities).

3.8 Storage(Stockpiling)

A. On the Site

1. Non-radioactive materials, including fill, may be temporarily stockpiled on the Site in the locations noted in the Contractor's approved Work Plan, or as approved or directed by the Respondents or their Agent.

   a. As necessary, staged non-radioactive materials shall be covered or otherwise managed to control dust.
   b. Non-radioactive materials shall be removed from the vicinity of the property by the end of the work.

2. Radioactive materials may be staged (temporarily stored) on the Site in locations noted in the Contractor's approved Work Plan.

   a. If not in the approved Work Plan, radioactive materials may be staged on the Site only with written approval from the Respondents or their Agent. These materials shall only be stored on contaminated or specially prepared areas to minimize the potential for contamination of "clean" areas.
   b. Except when work is actively in progress, the staged materials shall be completely covered with impermeable plastic sheeting or other approved covers.

3.9 Disposal

A. At a minimum, all materials shall be disposed as required by the permits, these Specifications, and the laws, rules and regulations of the USEPA, State of Illinois, and the State of Utah.. All materials disposed off the Site shall be surveyed as required by SOP-345 to determine they are suitable for the intended disposal.

B. If the materials are disposed by landfilling or by recycling, the Contractor shall provide the Respondents or their Agent and the Project Coordinator with the name of the landfill or recycler.

1. The landfill and recycler must be qualified to receive the waste. Qualification information must be provided for the landfill or recycler, by the Contractor.

2. The Respondents or their Agent has the right to reject any landfill or recycler which does not meet qualification standards.

3.10 Landscaping

Following completion of backfilling to proper line, elevation and grade, the Contractor shall return to the site and reinstall or replace all designated items to at least original condition, or as otherwise agreed by the Respondents and the property owner. This includes paving, slabs, fences, retaining walls, sprinkler

systems, sod, shrubs, bushes, trees and any other appurtenant landscaping, facilities and structures which were removed for or damaged by the work.

3.11 Surveying

A. A baseline will be established for the Site. This baseline will be tied to the previous USEPA survey done for the property.

B. Items including, but not limited to, the following will be located or identified in relation to the baseline.

1. Visible property boundaries.

2. Landscaping.

3. Facilities.

4. Structures.

5. Utilities.

6. Limits of radioactive contamination. Using the results of previous investigations and the baseline, sufficient stakes or markers will be placed to visibly mark the limits so any contaminated soil can be properly removed.

C. The baseline, as above, and the previous surveys also will be used to locate grids for verification surveying. The size of the grids will depend on the location and the extent of contamination.

D. The work for locating items such as the above can be done with equipment and materials such as the following:

1. Theodolite.

2. Compass.

3. Cloth or steel measuring tape.

3.12 Cleanup

Upon completion of work in this section, all rubbish, debris and excess soils (including fill materials) shall be removed from the job site. All construction equipment and implements of service shall be removed and the entire area involved shall be left in a neat, clean and acceptable condition. Proper cleanup of the properties shall be a condition of acceptance of the work and final payment.

TABLE 02200-1
RELEASE CRITERIA

From U.S. NRC, Regulatory Guide 1.86, Table 1

Nuclide [a]	Average [b,c]	Maximum [b,d]	Removable [b,e]
U_{nat}, U_{235}, U_{238}, and associated decay products	5,000 dpm α per 100 cm^2	15,000 dpm α per 100 cm^2	1,000 dpm α per 100 cm^2
Transuranics, Ra_{226}, Ra_{228}, Th_{230}, Th_{228}, Th_{230}, Pa_{231}, Ac_{227}, I_{125} and I_{129}	100 dpm per 100 cm^2	300 dpm per 100 cm^2	20 dpm per 100 cm^2
Thnat, Th_{232}, Sr_{90}, Ra_{223}, Ra_{224}, U_{232}, I_{126}, I_{131} and I_{133}	1,000 dpm per 100 cm^2	3,000 dpm per 100 cm^2	200 dpm per 100 cm^2
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr_{90} and others noted above.	5,000 dpm β-γ per 100 cm^2	15,000 dpm β-γ per 100 cm^2	1,000 dpm β-γ per 100 cm^2

a Where surface contamination by both alpha- and beta-gamma-emitting nuclides exists, the limits established for alpha- and beta-gamma-emitting nuclides should apply independently.

b As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

c Measurements of average contaminant should not be averaged over more than one square meter. For objects of less surface area, the average should be derived for each such object.

d The maximum contamination level applies to an area of not more than 100 cm^2.

e The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire surface should be wiped.

211 EAST GRAND AVENUE
CHICAGO, IL

Title: Site Utilities

Section 02840

Revision Number: 0

Date: November 5, 2010

Replaces: New

SECTION 02840

SITE UTILITIES

1.0 GENERAL

1.1 Scope

A. This section describes the general requirements for locating, protecting, removing and installing site utilities.

B. The known locations of utilities will be marked prior to start of work by utility locating contractors (DIGGER)..

1. Excavation to or below the locations of known utilities is expected as part of the work for the Site.

2. Utility lines and structures which are to remain in service shall be protected by the Contractor from any damage as a result of his operations.

3. All repair work, including backfilling, shall be done as required by the governing utility or agency. The Contractor shall contact the governing utility or agency and determine the requirements for properly completing the work.

1.2 Related Work

A. *Other Part 1 Sections of these Specifications*

B. Section 02010 - Demolition and Debris Removal

C. Section 02200 - Contaminated Material Loadout and Earthwork

1.3 Health and Safety

A. Detailed discussions of the potential hazards and the requirements for minimizing the potential for harm to project and offsite personnel, and to the environment, are provided in Section 01020 of these Specifications and the HASP.

B. All work shall be done under the supervision of personnel experienced and qualified for the work.

C. All work will be done as required by OSHA regulations published in 29 CFR 1910 and 1926. These regulations are included by reference in these Specifications.

D. Sampling and analyses of soils from the Site indicate levels of radioactivity in the soils above background levels. Based on the sampling and surveys, the work can proceed under Level D personal protection conditions (see HASP). Air and soil monitoring and sampling will be done during the work to determine if modifications to Level D work conditions are necessary (see Section 02010). Complete descriptions of health and safety requirements for this Site are provided in Section 01020 of these Specifications and the HASP.

1. The Contractor shall be prepared to discontinue work in an area and begin work in an alternate area if monitoring and sampling indicate changes in the work conditions may be necessary and if so directed by AECOM.

2. The Contractor shall be prepared to begin working under changed conditions (greater than or equal to Level D personal protection with appropriate personal equipment and vehicle

decontamination) with minimal delay. The requirements which may be necessary if asphalt, concrete, wood, metal or other construction materials containing hazardous materials or levels of radiation above background are encountered are discussed in Section 02010 of these Specifications.

E. The Field Team Leader or Health and Safety Coordinator may bar any person from the Site who, in their opinion, shows a disregard for health and safety requirements.

1.4 Environmental Safeguards and Regulations

The Contractor shall comply with all federal, state, and local regulations, and the requirements of these Specifications at all times to prevent pollution of air, water and soil. Detailed requirements for the protection of the environment are provided in Section 01020 and the HASP.

1.5 Permits

A. The Contractor shall be responsible for obtaining all permits required for the work and additions described in this section of these Specifications.

B. Copies of all the necessary permits shall be provided to AECOM or their Agent and to the Project Manager prior to beginning the work.

C. At a minimum, all work shall be done in accordance with the requirements of the permits or, if the work is exempted under CERCLA from any permits, in accordance with the substantive requirements which would apply if the work were not exempted from such permits. The requirements of these permits are included by reference in these Specifications. Where the requirements of the permits and these Specifications are in conflict, the more stringent requirements shall apply.

1.6 Quality Assurance

A. Contractor personnel shall be persons qualified by education and experience to perform the duties assigned.

B. The Field Team Leader shall be a person qualified and experienced in the work described in these Specifications. AECOM will provide a Quality Assurance Officer to review all project submittals.

C. All work shall be done according to the requirements of these Specifications.

1.7 Submittals

All submittals shall be made to the AECOM or its Agent.

2.0 PRODUCTS

2.1 Backfill Materials

A. General. Fill materials shall be obtained from suitable stockpiles or borrow as defined in these Specifications. Materials containing organic (except topsoil), perishable, spongy, frozen, expansive or other deleterious materials shall not be acceptable.

B. Embedment. Embedment material shall be fine aggregate or sand as defined by Part 2 of Section 02200 of these Specifications.

2.2 Utilities

Materials used to reconstruct utilities shall be as required by the utility company, the governing municipal agency, or the building code.

3.0 EXECUTION

3.1 Location

A. The known locations of utilities shall be identified prior to the start of any excavation. The Contractor shall be responsible for field verifying utility locations and for obtaining any necessary additional information to properly implement and execute the Work Plan.

   1. Known and suspected utilities are shown on the current site survey. The locations as shown may prove to be inaccurate and other obstructions not shown may be encountered. Any reliance on this information will be at the Contractor's risk. The Contractor shall arrange to have all utilities located by the utility companies or a utility location service prior to beginning work (e.g., DIGGER).

   2. Excavations in the areas of suspected underground utilities shall be done in compliance with current regulations for protection of utilities for the City of Chicago.

B. Utility lines and structures which are to remain in service shall be protected by the Contractor from any damage as a result of his operations.

   1. Where utility lines or structures not shown on the site survey are encountered, the Contractor shall report them to AECOM or its Agent before proceeding with the work.

   2. Unless their excavation is necessary to allow work to proceed or as a result of contamination, the Contractor shall bear the cost of repair or replacement of any marked utility lines or structures which are broken or damaged by his operations.

   3. All repair work, including backfilling, shall be done as required by the governing utility or agency. The Contractor shall contact the governing utility or agency and determine the requirements for properly completing the work.

3.2 Existing Utilities Designated for Excavation

A. Overhead Utilities shall be removed and replaced by the utility if such is necessary for proper completion of the work. If the utility will not or cannot remove them, procedures for excavation will be discussed with and approved by the utility. At a minimum, removal of overhead utilities shall include the following.

   1. Obtain the necessary disconnects and verify the utilities are de-energized and grounded prior to the work.

   2. Remove cables and guy-wires from the utility poles.

   3. Determine if the above- and below-grade sections of the poles are contaminated with radiological materials.

      a. If the above-grade sections are not contaminated and the lower section is, or if the potential for contamination of the below-grade section is unknown, fell above-grade sections of utility poles by sawing or other suitable methods to separate the uncontaminated above-grade sections from the potentially contaminated below-ground section.

b. If both sections are contaminated, the pole may be removed by felling the above-grade part and excavating the below-grade part, or by pulling the pole from the ground with a crane or other equipment.

4. Uncontaminated components of overhead utilities, such as cables, guy-wires, etc., shall be disposed as required by Section 02010 of these Specifications.

5. Contaminated components of overhead utilities shall be removed and processed for loadout and disposal as other contaminated debris (see Section 02010 of these Specifications).

6. Excavated materials shall be handled as required by Subparts 3.5, 3.6, 3.8 and 3.9 of Section 02010 of these Specifications.

B. Underground Utilities to be removed may be removed by the utility. At a minimum, the following procedures shall be used.

1. Obtain the necessary disconnects or shutoffs prior to the work and verify the utility is de-energized, drained, or purged as necessary (lock-out and tag-out procedures properly implemented).

2. Excavate and manage materials to access contaminated utilities or bedding materials as required in Subparts 3.5, 3.6, 3.8 and 3.9 of Section 02010 of these Specifications. Monitoring of excavations will be required both on-site and in adjacent rights-of-way.

3. Remove, decontaminate and dispose of contaminated utility materials as required in subparts 3.5, 3.6, 3.8 and 3.9 of Section 02010 of these Specifications.

4. Replace, repair, or abandon the removed utility as directed by these Specifications and the Work Plan, or the utility company or municipal agency having jurisdiction.

a. Replacement or repairs of the utilities shall be in accordance with the requirements of these Specifications or the utility or agency.

b. Abandoned utilities shall be capped as required by Article 3.3 of this section.

3.3 Underground Utilities Encountered During Excavation

A. Damage to utilities shall be repaired under the supervision of the respective utility service or municipal agency having jurisdiction.

B. Abandoned utilities shall be cleaned of all encrusted contamination. Open ends or broken pipes shall be properly capped.

1. At a minimum, capping may be done by crimping, pouring concrete around, or plugging the open end in such a way as to prevent a "least path of resistance" for any future gas leaks.

2. Capping will be done as required by the utility or municipal agency if their requirements exceed those above.

C. Active utilities shall be supported in-place, if suitable, or removed and replaced as necessary to excavate to the depths shown in the Work Plan.

1. Support or removal and replacement shall comply with the more stringent requirements of the affected utility or municipal agency or these Specifications.

2. Utility lines, whether removed or left in-place, shall be cleaned of encrusted contamination as required and described by Section 02010 of these Specifications.

3. Removed utilities shall be managed and disposed as required in Section 02010 for other demolition debris.

3.4 Underground Utility Installations

A. The Contractor shall coordinate interruptions of utility services through AECOM or its Agent.

B. If utilities are installed after backfilling is complete, all excavations shall be by open cut.

1. The banks of the trenches should be as vertical as possible. Shoring and bracing, as necessary shall be designed by a qualified Professional Engineer competent in soils engineering. The design of shoring and bracing shall be provided to AECOM or its Agent.

2. If rock is encountered, the base of the trench will be overexcavated at least six inches to allow for placement of bedding material.

C. If utilities are installed before backfilling is completed to final line, elevation and grade, the fill shall be to at least 12 inches above the top of the utility before excavation and placement of the utility is begun.

D. Trench Preparation. The bottom of the trench shall be accurately excavated to line, and graded and shaped to fit the lower one-quarter of the pipe to provide uniform bearing and support for each section; wedging and blocking will not be permitted. If the pipe has bell ends, the trench shall be overexcavated at the joints. If the common fill is granular, the base of the trench shall be scarified to a depth of six inches and recompacted to at least 95% of maximum density at ±2% of optimum moisture (standard proctor, ASTM D698). If the common backfill is not granular in nature, the base of the trench shall be overexcavated six inches and backfilled with granular (embedment) material compacted to at least 95% of maximum density at ±2% of optimum moisture.

E. Utility Embedment, All utility lines except electric lines and irrigation lines two inches or less in diameter shall be embedded in fine aggregate (see Subpart 2.1.13 of this section).

1. Embedment material shall extend a distance equivalent to the utility diameter above, below and to the sides of the utility for utilities greater than six inches in diameter. A six-inch embedment shall be provided for utilities less than or equal to six inches in diameter.

2. Care shall be taken not to disturb either the horizontal or vertical alignment of the utility; embed both sides of the utility simultaneously. If necessary, compact embedment material by hand to avoid displacement and damage to the utility.

F. All utility installations shall be inspected by AECOM, and by the utility or municipal agency if necessary, at the following times.

1. Before placing embedment material over the utility.

2. Before placing common fill over the embedment material.

G. Compaction of common material over the utility shall be by manually-operated power equipment or by hand until at least 12 inches of fill has been placed over the utility. Damage to the utility by compaction or other causes after proper installation shall be the responsibility of the Contractor.

H. Tests. Testing shall be done on all repaired or replaced systems. Testing may be done by the utility or municipal agency or Contractor. All testing will be done as required by the utility, municipal agency or applicable building code. All testing will be done in the presence of AECOM, and utility, municipal agency or building inspectors, as necessary.

Appendix G

Health and Safety Plan

211 EAST GRAND AVENUE
CHICAGO, IL

Title: Hea th and Safety Plan

Revision Number: 0

Date: Nov ember 5, 2010

Replaces: New

TABLE OF CONTENTS

Emergency Phone Numbers i
Hospital Location Map and Directions ii
1.0 SCOPE OF PLAN 2
2.0 SAFETY MANAGEMENT 3
2.1 Health and Safety Coordinator 3
3.0 PERSONNEL RESPONSIBILITIES 5
4.0 HAZARD ASSESSMENT 6
4.1 Principal Contaminants (Known or Suspected) 6
4.2 Physical Hazards 6
4.2.1 Heat Stress 7
4.2.2 Cold Stress 7
4.2.3 Electrical Hazards 8
4.2.4 Noise Hazard 8
4.2.5 Overt Chemical Exposure 8
4.2.6 Adverse Weather Conditions 8
4.3 Medical Evaluation and Surveillance Program 9
4.3.1 Dosimetry/Personnel Monitoring 9
4.3.2 Requirement for Dosimetry 9
4.3.3 Bioassay 9
4.3.4 Emergency Medical Treatment 9
4.4 Accident and Incident Reporting 10
5.0 TRAINING 14
5.1 Project- and Site-Specific Training 14
5.2 Visitor Orientation 14
5.3 Safety Tailgate Meetings 14
5.4 First Aid 14
5.5 Safe Work Permit 14
6.0 COMMUNICATIONS 23
6.1 General Communications 23
6.2 Radio/Telephones 23
6.3 Emergency Warning 23
6.4 Hand Signals 23
6.5 Site Security 23
7.0 PERSONNEL EXPOSURE AND AIR QUALITY MONITORING 24
7.1 Air Quality (Dust) 24
7.2 Airborne Radioactivity Monitoring 24
7.3 Internal Monitoring 25
7.4 External Radiation Monitoring 25
7.5 Radiological Surveys 25
7.6 Contamination Monitoring 25
7.7 Total Organic Vapor Monitoring 26
7.8 Action Levels 26
7.8.1 Radiological Action Levels 26
7.8.2 Organic Vapors Action Levels 26
8.0 PERSONAL PROTECTIVE EQUIPMENT 28
9.0 CONTAMINATION REDUCTION PROCEDURES 29
9.1 Equipment 29
9.2 Personnel 29
9.3 Contamination Prevention 29
9.4 Disposal Procedures 30
10.0 GENERAL WORK PRECAUTIONS 31
10.1 General Work Precautions 31
10.2 Operational Precautions 31
11.0 SANITARY FACILITIES 33

11.1 Potable Water 33
11.2 Toilet Facilities 33
11.3 Washing Areas 33
12.0 FIRE CONTROL EQUIPMENT 34
13.0 CONFINED SPACE PROGRAM 35
13.1 Purpose 35
13.2 Responsibilities 35
13.2.1 Health and Safety Coordinator 35
13.2.2 Project Manager 35
13.2.3 Field Team Leader 35
13.2.4 Personnel 35
13.3 Definition of a Confined Space 36
13.4 Confined Space Entry Procedures 36
13.4.1 Safety Work Permit Required 36
13.4.2 Pre-entry Testing for Potential Hazards 36
13.4.3 Rescue Procedures 37
13.5 Training 37
13.6 Safe Work Practices 37
14.0 ELECTRICAL LOCKOUT/TAGOUT 39

TABLES

Table 7.1 Action Levels as Determined by Radioactivity 27

FIGURES

Figure 1.1 Visitor Information Sheet 2
Figure 2.1 Project Management Organization Chart 4
Figure 4.1 Accident/Exposure Investigation Report 12
Figure 5.1 Safety Meeting Report 17
Figure 5.2 Safe Work Permit 19
Figure 5.3 Site Safety Plan 21

EMERGENCY PHONE NUMBERS

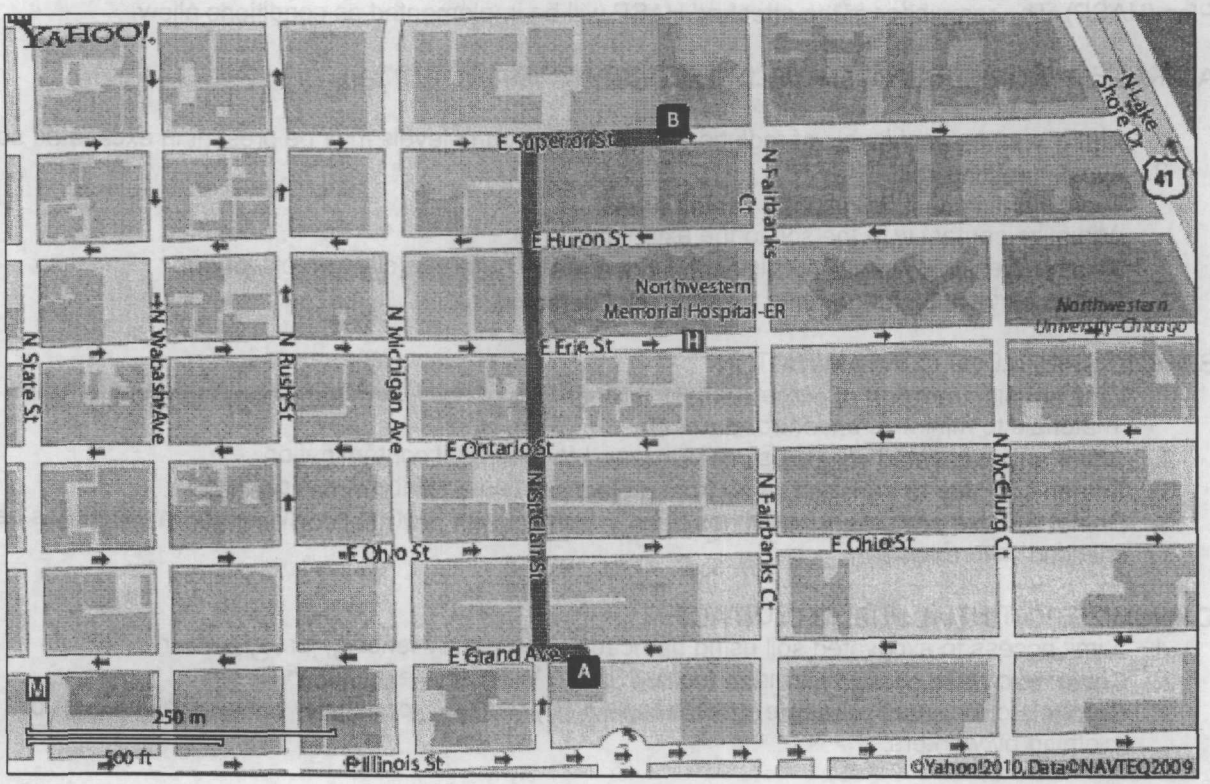
IN THE EVENT OF AN EMERGENCY DIAL 911

AMBULANCE SERVICE	911
FIRE DEPARTMENT	911
EMERGENCY RESCUE SERVICE	911
POLICE DEPARTMENT	911
NATIONAL RESPONSE CENTER	1-800-424-8802
POISON CONTROL CENTER	1-800-732-2200
NORTHWESTERN MEMORIAL HOSPITAL	(312) 908-2000
PROJECT COORDINATOR (Steve Kornder)	(847) 279-2448
	(847) 343-6007 cell
ILLINOIS EMERGENCY MANAGEMENT AGENCY	(217) 782-7860
Dept of Nuclear Safety(IDNS) Emergency Number	(217) 785-0600 [1]
USEPA REGION 5 24-HOUR EMERGENCY NUMBER	**(312) 353-2318**

[1] Primary notification should be made to USEPA Region 5. The IDNS emergency number (217-785-6000) can be used as a secondary notification number.

Hospital Location and Directions

Northwestern Memorial Hospital
250 E. Superior Street
Chicago, IL 60611



Directions:

1.	**Start at 211 E GRAND AVE, CHICAGO going toward N ST CLAIR ST**	**go 121 ft**
2.	**Turn on N ST CLAIR ST**	**go 0.27 mi**
3.	**Turn on E SUPERIOR ST**	**go 423 ft**
4.	**Arrive at 250 E SUPERIOR ST, CHICAGO, on the left**	

EMERGENCY PLAN

In the event excavation within the potentially impacted area (site specific) is required on an emergency basis, the following shall be incorporated to the extent possible, and all personnel working in the potentially impacted areas shall be given the opportunity to read this section of the Health and Safety Plan (HASP). The remainder of the attached HASP will be implemented as conditions allow.

A. PROTECT WORKERS POTENTIALLY EXPOSED TO IMPACTED SOIL

1. Notify workers that levels of radiation above background levels may be present in excavated soil.
2. Avoid ingesting soil.
   Avoid inhaling dust from contaminated areas.
   Minimize contact with the soil to the extent possible.
   Wear protective coveralls or disposable coveralls to facilitate cleanup of workers.
3. Screen excavation for gamma radiation (NaI detector).

B. AVOID SPREAD OF CONTAMINATION

1. Limit erosion transport of excavated soil through use of hay bales, sand bags, temporary berm materials to minimize uncontrolled runoff.
2. Cover any excavated soil piles until screened for potential contamination.
3. Screen soil prior to transport away from project site using NaI gamma detector.
4. Do not remove equipment which has been in contact with potential contamination until it has been checked and released.

C. MINIMIZE POTENTIAL PUBLIC CONTACT.

1. Limit access to excavated soil using barricades, temporary fencing, jersey barriers.
2. Cover excavated piles to minimize fugitive dust. Wet dusty excavations.
3. Control, to the extent possible, off-site tracking by vehicles, potentially contaminated boots or clothing by workers.

D. MONITOR CONTAMINATION

1. To the extent practicable, provide gamma radiation screening of the exposed soils in the excavation (NaI detector).
2. When possible, provide high volume air samplers immediately adjacent to potential or known exposed contaminated soil, to monitor for fugitive emissions (dust, radon gas).
3. Survey ground surface/pavement surface around potential or known contamination locations for elevated gamma radiation (NaI detector).

E. DISPOSAL

1. Any excavated material should be disposed as required by law.

F. NOTIFY AUTHORITIES

1. Notify agencies identified on the enclosed emergency notification list.

Notification should include, as a minimum, the following

1. Location of Excavation
2. Potential Contact with Thorium Containing Soil
3. Field surveys and sampling measured a maximum reading of _____ cpm (if readings have been taken) in soils remaining, although higher concentrations may be present.

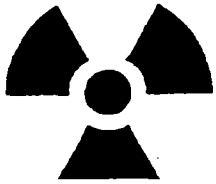
1.0 SCOPE OF PLAN

The following Health and Safety Plan (HASP) will be utilized and modified as necessary in order to minimize and prevent exposures to hazardous substances and conditions related to all excavation and restoration activities at the Site. All personnel assigned to this project will be required to review thoroughly the contents of the HASP and to strictly adhere to the policies and procedures listed herein. This HASP is for use only by AECOM as the remediation manager and by their designated contractors and consultants, and approved Site visitors. USEPA, and other agencies, are not considered visitors and will be required to conform to their own Health and Safety Plans.

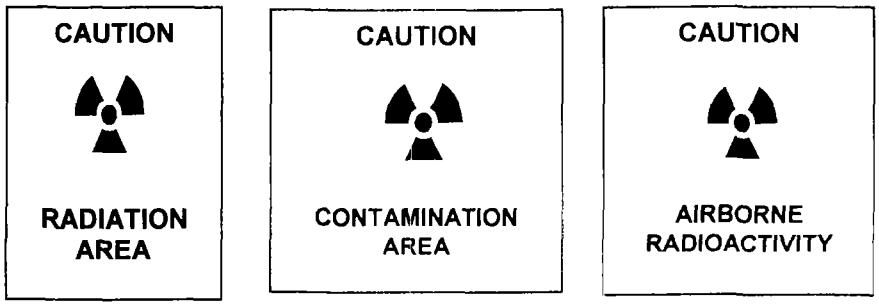
This plan meets the requirements of OSHA 29 CFR 1910.120, Hazardous Waste Operations and Emergency Response, and applicable subparts of OSHA 29 CFR 1926, 1910 and 10 CFR. Visitors will be required to review the health and safety plan and read and sign the visitor information sheet (Figure 1.1).

FIGURE 1.1
VISITOR INFORMATION SHEET

NOTICE TO VISITOR: ALL VISITORS MUST BE ESCORTED AT ALL TIMES WHILE ON THIS SITE.



CAUTON. Radioactive materials may be present on this site. Radioactive materials may be found throughout the site. Grounds, and equipment have low levels of contamination.



CONTROLLED AREAS: Do not enter areas with these signs unless you have an escort or health physics has given specific approval and you understand access limitations.

You must wear protective clothing in controlled areas. Health physics will provide you with instructions.

You must wear a personal radiation dosimeter if you enter an area which is controlled.

No smoking, eating, drinking or chewing in controlled areas.
NO EXCEPTIONS.

.Notify Health Physics if you do not understand these instructions.

Signature _____ Date _____

2.0 SAFETY MANAGEMENT

The following safety management structure, Figure 2.1, will be utilized for the implementation, administration, and monitoring of the HASP.

2.1 Health and Safety Coordinator

The Health and Safety Coordinator (HSC) shall assume overall responsibility for the HASP. The HSC or designee shall monitor and maintain quality assurance of the HASP until project completion. Principal duties of the HSC include:

- Review project background data,
- Approve all HASP modifications,
- Administer and enforce the HASP,
- Evaluate the adequacy of personal protective equipment (PPE) to be used by Site personnel,
- Conduct required on-site training except tailgate safety meetings that will be conducted by the Field Team Leader,
- Brief visitors on work Site conditions, and
- Administer personnel and perform ambient air monitoring procedures.

The HSC or designee has the authority to stop work in the event conditions develop which pose an unreasonable risk to Site personnel or persons in the vicinity.

PROJECT MANAGEMENT ORGANIZATION CHART

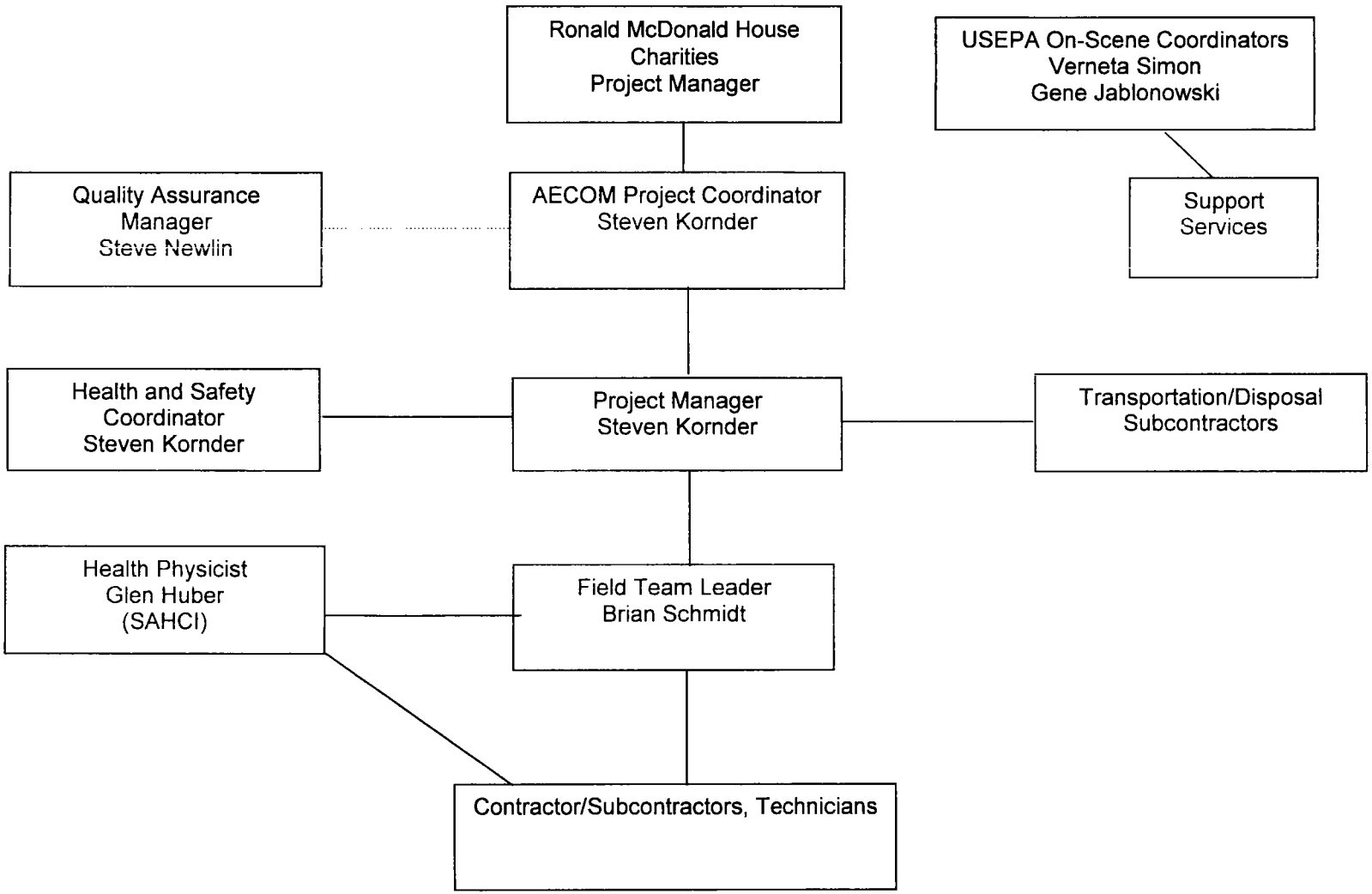


Figure 2.1

3.0 PERSONNEL RESPONSIBILITIES

The HSC or designee will administer and supervise the HASP at the work-site level. He will monitor all operations and will be the primary on-site contact for health and safety issues, and will have full authority to stop operations if conditions are judged to be hazardous to on-site personnel or the public.

The HSC will brief all Site personnel on the contents of the HASP. Personnel will be required to review the HASP, and have the opportunity to ask questions about the planned work or hazards. The Field Team Leader will conduct tailgate safety meetings to familiarize the Site personnel with Site conditions, boundaries, and physical hazards. Site personnel will conduct their assigned tasks in accordance with the HASP at all times. As necessary, the Field Team Leader will conduct radiation training and provide briefings on radiation issues that arise during construction. These activities will take place as part of the tailgate safety meetings, or during special meetings to address more immediate concerns, dependent on the issues being addressed.

If at any time Site personnel observe unsafe conditions, faulty equipment or other conditions which could jeopardize personnel health and safety, they are required to immediately report their observations to the HSC or Field Team Leader.

Work zones will be established at the Site. These zones include clean/support zones, decontamination zones, and exclusion zones. Although the clean/support zones are anticipated to remain fixed, other zones will move about the Site as excavation work progresses.

4.0 HAZARD ASSESSMENT

The following represents potential hazards associated with this project.

4.1 Principal Contaminants (Known or Suspected)

Radioactive Contamination:

- Thorium: the entire thorium (Th-232) decay chain
- Uranium: the entire uranium (U-238) decay chain
- Actinium: the entire uranium (U-235) decay chain
- Radium: Ra-226 and Ra-228
- Radon: Rn-220 and Rn-222

The known total radium concentration present in the soil potentially exceeds 100 pCi/g for some locations within the project site. The following primary routes of entry to the body will be considered:

Route	Entry Made Via
Inhalation	Airborne dust containing heavy metal radionuclides and radon.
Ingestion	Airborne dust containing heavy metal radionuclides/contaminants. Improper or poor personal hygiene practices.
Eye and Skin	Direct contact with contaminants. Improper or poor personal hygiene practices. Airborne dust containing heavy metal/radionuclide contaminant. Cuts and abrasions.
Direct Exposure	Penetrating gamma radiation in air and soil. Exposure to X-rays.
Chemical Contamination	Polynuclear Aromatic Hydrocarbons (PAHs)

PAH contamination is present in the urban fill materials on site. These materials include coal cinders, ash and fire debris. Typical PAH concentrations are in the low part per million range.

The use of personal protective equipment, proper procedures and dust suppression activities will minimize any hazard to site personnel from either the elevated radioactivity or PAH contamination. Specific safety procedures will be covered in subsequent sections of this Site Safety Plan.

Route	Entry Made Via
Inhalation	Airborne dust
Ingestion	Airborne dust Improper or poor personal hygiene
Skin and Eye	Direct contact with contaminated soil Improper or poor personal hygiene *Airborne dust* Cuts and abrasions

4.2 Physical Hazards

Before field activities begin, the HSC will conduct a Site reconnaissance to identify any real or potential hazards created from Site activities. Physical hazards inherent to construction activities and power-operated equipment may exist.

4.2.1 Heat Stress

Field activities in hot weather create a potential for heat stress. The warning symptoms of heat stress include fatigue; loss of strength; reduced accuracy, comprehension and retention; and reduced alertness and mental capacity. To prevent heat stress, personnel shall receive adequate water supplies and electrolyte replacement fluids, and maintain scheduled work/rest periods.

The Field Team Leader or designee shall continuously visually monitor personnel for signs of heat stress. In addition, field personnel will be instructed to observe for symptoms of heat stress and methods on how to control it. One or more of the following control measures can be used to help control heat stress.

- Provision of adequate liquids to replace lost body fluids. Employees must replace body fluids lost from sweating. Employees must be encouraged to drink more than the amount required to satisfy thirst, 12 to 16 ounces every half-hour is recommended. Thirst satisfaction is not an accurate indicator of adequate salt and fluid replacement. Replacement fluids can be commercial mixes such as Gatorade.

- Establishment of a work regimen that will provide adequate rest periods for cooling down. This may require additional shifts of workers.

- Breaks should be taken in a cool and shaded rest area (77 degrees is best).

- Employees shall remove impermeable protective garments during rest periods.

- Employees shall not be assigned other tasks during rest periods.

- All employees shall be informed of the importance of adequate rest, acclimation, and proper diet in the prevention of heat stress.

4.2.2 Cold Stress

Field activities are anticipated during cold weather during a period when temperatures average below freezing. The following guidelines will be followed.

Persons working outdoors in temperatures of 40 degrees and below may suffer from cold exposure. During prolonged outdoor periods with inadequate clothing, effects of cold exposure may even occur at temperatures well above freezing. Cold exposure may cause severe injury by freezing exposed body surfaces (frostbite) or result in profound generalized cooling, possibly causing death. Areas of the body which have high surface area-to-volume ratios such as fingers, toes and ears are the most susceptible to frostbite.

Two factors influence the development of a cold injury: ambient temperature and the velocity of the wind. Wind chill is used to describe the chilling effect of moving air in combination with low temperature. For instance, 10° F with a wind of 15 miles per hour (mph) is equivalent in chilling effect to still air at -18°F.

As a general rule, the greatest incremental increase in wind chill occurs when a wind of 5 mph increases to 10 mph. Additionally, water conducts heat 240 times faster than air. Thus, the body cools suddenly when external chemical-protective equipment is removed if the clothing underneath is perspiration-soaked.

Local injury resulting from cold is included in the generic term "frostbite". There are several degrees of damage. Frostbite of the extremities can be categorized into:

- Frost nip or incipient frostbite: Characterized by sudden blanching or whitening of skin.

- Superficial frostbite: Skin has a waxy or white appearance and is firm to the touch, but tissue beneath is resilient.

- Deep frostbite: Tissues are cold, pale, and solid; extremely serious injury.

Prevention of frostbite is vital. Keep the extremities warm. Wear insulated clothing as part of one's protective gear during extremely cold conditions. Check for symptoms of frostbite at every break. The onset is painless and gradual - you might not know you have been injured until it is too late.

To administer first aid for frostbite, bring the victim indoors and rewarm the areas quickly in water 95° to 100°F. Give individual a warm drink - not coffee, tea, or alcohol. The victim should not smoke. Keep the frozen parts in warm water or covered with warm clothes for 30 minutes, even though the tissue will be very painful as it thaws; then elevate the injured area and protect it from injury. Do not allow blisters to be broken. Use sterile, soft, dry material to cover the injured areas. Keep victim warm and get immediate medical care.

4.2.3 Electrical Hazards

Overhead power lines, downed electrical wires, buried cables and improper use of electrical extension cords can pose a danger of shock or electrocution. All Site personnel should immediately report to the Field Team Leader any condition that could result in a potential electrical hazard.

The Field Team Leader will notify Site personnel during the safety meetings of the locations of known underground cables and utilities.

4.2.4 Noise Hazard

Operation of equipment may present a noise hazard to workers. Site personnel will utilize hearing protection when noise levels are determined to be in excess of 29 CFR 1910.95 requirements. Noise monitoring will be performed by the HSC as needed.

4.2.5 Overt Chemical Exposure

Typical response procedures include:

SKIN CONTACT:
Use copious amounts of soap and water. Wash/rinse affected area thoroughly, then provide appropriate medical attention. Eye wash will be provided on-site at the work zone and support zone as appropriate. If affected, eyes should be continuously flushed for a minimum of 15 minutes.

INHALATION:
Move to fresh air and transport to hospital. Decontaminate as other actions permit.

INGESTION:
Transport to emergency medical facility. Decontaminate as permitted by other requirements.

PUNCTURE WOUND OR LACERATIONS:
Transport to emergency medical facility. Field Team Leader will provide chemical safety information to medical personnel as requested. Decontaminate as permitted by other requirements.

4.2.6 Adverse Weather Conditions

In the event of adverse weather conditions, the Field Team Leader will determine if work can continue without endangering the health and safety of field workers. Some items to be considered before determining if work should continue are:

- Potential for heat stress and heat-related injuries.
- Potential for cold stress and cold-related injuries.
- Treacherous weather-related working conditions.
- Limited visibility.
- Potential for electrical storms or high winds.

4.3 Medical Evaluation and Surveillance Program

All field project personnel shall receive a medical evaluation in accordance with 29 CFR 1910.120. Personnel who receive a medical evaluation will be notified by the medical contractor as to the outcome of their evaluation. This will be in the form of a confidential report addressed to the individual and will contain a breakdown of the clinical findings. In addition, it will indicate any areas of concern which would justify further medical consultation by the individual's personal physician. In the event that the areas of concern are of a severe nature, a follow-up notification will be made to the individual by the medical consultant to answer any questions the employee may have.

4.3.1 Dosimetry/Personnel Monitoring

Project personnel involved with remedial activities within an exclusion zone will participate in a dosimetry program administered by the HSC. (The dosimetry program shall comply with 32 IAC 340[1], i.e., dosimeters will be processed by a dosimetry processor accredited by the National Voluntary Laboratory Accreditation Program.) The HSC shall maintain records of all radiation exposures incurred by field personnel including all contractors. These records will be maintained in an up-to-date manner to comply with the requirements of 32 IAC 340.4010. The HSC shall review the results of personal exposure monitoring to determine compliance with exposure limit requirements.

4.3.2 Requirement for Dosimetry

Personal dosimetry is required for anyone who enters a radiologically controlled area in which he/she may receive in one calendar year a dose in excess of 10% of the limits in 32 IAC 340. Any person who works in a radiation area will be required to have a personal dosimeter. As a matter of policy, individuals will be required to use a dosimeter (either self-reading type, film badge, Thermoluminescence Detector (TLD) or Optically Stimulated Luminescence Dosimeter (OSL)) whenever they enter the Exclusion Zone.

4.3.3 Bioassay

Bioassay is the determination of the types and amounts of radioactive materials, which are inside the body. By analyzing the rate of deposition, the rate of excretion, and any other available information regarding placement in the body, internal exposures from radioactive materials can be estimated.

Procedures for bioassay will be consistent with the previous Lindsay Light Health and Safety Plan. Bioassays are not anticipated to be required for the excavation and removal activities proposed, based on levels documented as present.

The decision to use bioassay will be made by the Health and Safety Coordinator. In the event that a worker has an excessive intake or the potential to receive greater than 10% of the Annual Limit on Intake (ALI) , bioassay shall be ordered. Data from Lapel Air Samplers shall be used as a factor in determining whether or not bioassay is warranted. If workers are found to have been present in locations where airborne radioactivity concentrations are found to be greater than 30% of the Derived Air Concentration, bioassay will be considered.

4.3.4 Emergency Medical Treatment

[1] The IDNS regulations are usually more restrictive than US Nuclear Regulatory Commission (NRC) regulations. However, if there is a conflict between IDNS and NRC regulations, the NRC regulations will be used to determine compliance

Emergency first aid should be administered on-site as appropriate. The individual should be decontaminated if possible, depending on the severity of the injury, and transported to the nearest medical facility, if needed. Treatment of the injury is of primary concern and decontamination a secondary concern. Levels of radioactive contamination at the Site could be acutely hazardous if decontamination is not undertaken during an emergency situation. The Field Team Leader will complete the appropriate incident report, if warranted. See Section 4.4, Accident and Incident Reporting.

An emergency first-aid station will be established and will include a first-aid kit for onsite emergency first aid.

Provisions for emergency medical treatment shall be integrated with the following guidelines:

- At least one individual qualified to render first aid and Cardiopulmonary Resuscitation (CPR) will be assigned to each shift.
- At least one individual trained in radiation emergency response will be assigned to each shift
- Emergency first aid stations in the immediate work vicinity.
- Conspicuously posted phone numbers and procedures for contacting ambulance services, fire department, police, and medical facilities.
- Maps and directions to medical facilities.
- Conspicuously posted evacuation routes and gathering area locations shall be posted around the Site.

4.4 Accident and Incident Reporting

All accidents, injuries, or incidents will be reported to the HSC. This accident/incident will be reported as soon as possible to the employee's supervisor. An Accident/Incident Form will be completed by the Field Team Leader, and a copy will be forwarded to the AECOM Project Manager. A copy of the form is shown as Figure 4.1.

FIGURE 4.1
ACCIDENT/EXPOSURE INVESTIGATION REPORT

COMPANY			DATE
INVESTIGATION TEAM			
EMPLOYEE'S NAME & ID			
SEX	AGE	JOB DESCRIPTION	
DEPARTMENT & LOCATION			
ACCIDENT DATE & TIME			
DATE & TIME ACCIDENT REPORTED TO SUPERVISOR			
NATURE OF INCIDENT			
NATURE OF INJURY			
REFERRED TO MEDICAL FACILITY/DOCTOR ☐ YES ☐ NO			
EMPLOYEE RETURNED TO WORK ☐ YES DATE/TIME _____ ☐ NO			
☐ INJURED EMPLOYEE INTERVIEW/STATEMENT - ATTACHED			
WITNESSES			
☐ WITNESSES INTERVIEWS/STATEMENTS ATTACHED			
☐ PHOTOGRAPHS OF SITE - ATTACHED			
☐ DIAGRAMS OF SITE - ATTACHED			
EQUIPMENT RECORDS - ATTACHED - REVIEWED	☐ YES	☐ NO	
ACCIDENT/EXPOSURE INCIDENT DESCRIPTION			

FIGURE 4.1
ACCIDENT/EXPOSURE INVESTIGATION REPORT

ACCIDENT DESCRIPTION		
DATE & TIME	LOCATION	
EMPLOYEES INVOLVED		
PREVENTIVE ACTION RECOMMENDATIONS		
CORRECTIVE ACTIONS COMPLETED	MANAGER RESPONSIBLE	DATE COMPLETED

EMPLOYEE LOST TIME - TEMPORARY HELP - CLEANUP - REPAIR - DISCUSSION			
ACCIDENT COST ANALYSIS	INVESTIGATION	COMPLIANCE	TOTAL COST
MEDICAL			
PRODUCTION LOSS			

REPORT PREPARED BY	DATE COMPLETED
SAFETY COMMITTEE REVIEW ☐ YES	☐ NO
CORRECTIVE ACTION	DATE STARTED
SAFETY COMMUNICATION NOTICE PREPARED	DATE
SAFETY DIRECTOR SIGNATURE	

FIGURE 4.1
ACCIDENT/EXPOSURE INVESTIGATION REPORT

ACCIDENT DESCRIPTION	
DATE & TIME	LOCATION
EMPLOYEES INVOLVED	
EMPLOYEE INTERVIEW/STATEMENT - INJURED EMPLOYEE - WITNESS	
EMPLOYEE NAME	
INTERVIEWED BY	

ACCIDENT DIAGRAM/PHOTOGRAPHS

5.0 TRAINING

All Site personnel potentially in contact with impacted soil or who are involved in the excavation and/or loading for transport of radiologically-impacted soil shall be trained and certified in accordance with 29 CFR 1910.120.

5.1 Project- and Site-Specific Training

Prior to project start-up, all assigned personnel shall receive an initial project- and site-specific training session. This training shall include, but not be limited to, the following areas:

- Review of the Health and Safety Plan;
- Review of general radiation principles and compounds;
- Review of applicable radiological chemical and physical hazards;
- PPE levels to be used by Site personnel;
- Site security control;
- Emergency response and evacuation procedures;
- Project communication;
- Required decontamination procedures;
- Prohibited on-site activities;
- Instructions to workers in accordance with 10 CFR 19.12; and
- U.S. NRC Regulatory Guide 8.13 and Declared Pregnant Woman Policies (Females).

5.2 Visitor Orientation

All non-essential personnel and visitors who plan to enter the exclusion zone will be briefed on the HASP requirements and 10 CFR 19.12 requirements prior to entry with a trained Site escort. In addition, female visitors will be instructed regarding U.S. NRC Regulatory Guide 8.13 and Declared Pregnant Woman Policies.

5.3 Safety Tailgate Meetings

Before the start of the work week, on Monday morning, the Field Team Leader will assemble the Site personnel for a brief safety meeting. Additional meetings will be conducted throughout the week, as needed, to address safety concerns and precautions. The purpose of these meetings will be to discuss project status, problem areas, conditions, safety concerns, PPE levels and to reiterate HASP requirements. The Field Team Leader will complete a Safety Meeting Report (Figure 5.1) to indicate the contents of the meeting and the attendees.

5.4 First Aid

At least one (1) individual, trained and qualified to administer first aid and CPR in accordance with American Red Cross requirements, who is also trained in radiological response, will be present at the Site.

5.5 Safe Work Permit

Site workers in special work conditions such as confined space. hot work, trenching, or other physical hazards, must be skilled at such work and trained to recognize these as special work conditions. Confined space is defined by OSHA 1910.146. Section 13 of this HASP contains further information on the confined space program to be followed.

Figure 5.2 shows the Safe Work Permit to be completed by the HSC and signed by workers for special work conditions.

Figure 5.3 show the issues which will be addressed in the event soil is encountered which exhibits low level contamination. The potential low level contamination includes the presence of possible residual petroleum products from an existing or former underground storage tank or other source of fuel or polynuclear aromatics hydrocarbons (PAHs) contamination, such as tar, cinders, or coal ash.

FIGURE 5.1
SAFETY MEETING REPORT (Page 1 of 2)

DATE	DURATION OF MEETING	
	FROM: ☐ A.M. ☐ P.M.	TO: ☐ A.M. ☐ P.M.
NUMBER PRESENT / NUMBER ABSENT	MEETING CONDUCTED BY	DID MEETING INCLUDE REQUIRED TRAINING? ☐ YES (DESCRIBE BELOW) ☐ NO

HEALTH AND SAFETY COORDINATOR'S PRESENTATION	DISCUSSION OF SAFE/UNSAFE WORK PRACTICES, MATERIALS, PRECAUTIONS, HAZARDS, EQUIPMENT FAMILIARIZATION, ETC.
SITE WORKER FEEDBACK	COMMENTS, QUESTIONS COMPLAINTS, ETC.
HEALTH AND SAFETY COORDINATOR'S CORRECTIVE ACTION PLAN	KNOWN PLANS FOR CORRECTION, PARTS ON ORDER, ITEMS TO BE DISCUSSED WITH DEPART. HEAD, AND CORRECTION O. ITEMS PREVIOUSLY SUBMITTED
PROJECT MANAGER'S COMMENTS	RESOLUTION OF QUESTIONS, ITEMS OR ISSUES RAISED IN MEETING OR WITH SUPERVISOR

HEALTH AND SAFETY COORDINATOR	PROJECT MANAGER
FIELD TEAM LEADER	HAVE SITE WORKERS ATTENDING SIGN ON REVERSE SIDE. FORWARD A COPY TO THE PROJECT COORDINATOR

FIGURE 5.1
SAFETY MEETING REPORT (Page 2 OF 2)

TO BE SIGNED BY ALL SITE WORKERS ATTENDING THE MEETING

I HAVE RECEIVED AND UNDERSTAND THE INFORMATION AND/OR TRAINING INDICATED ON THE REVERSE SIDE.

SIGNATURE	DATE	SIGNATURE	DATE

LIST ALL SITE WORKERS ABSENT FROM THE MEETING

FIGURE 5.2
SAFE WORK PERMIT (Page 1 of 2)

COMPLETED PERMIT MUST BE POSTED AT THE ENTRY OR WORK SITE.

ISSUED BY	DATE	TIME (FROM) ☐ A.M. ☐ P.M.	TIME (TO) ☐ A.M. ☐ P.M.
ACCEPTED BY		RESPONSIBILITY TRANSFERRED TO (NAME)	
LIST ALL WORKS (ON BACK) OR ATTACH ROSTER			

SECTION 1 — GENERAL AREA WORK PERMIT

1. WORK LIMITED TO THE FOLLOWING: (DESCRIPTION AND AREA/EQUIPMENT)

2. SAFETY EQUIPMENT (OTHER THAN AREA REQUIREMENTS) ☐ NONE

☐ RAIN SUIT ☐ GLOVES ☐ FACE SHIELD ☐ GROUND FAULT CIRCUIT INT. ☐ AIR PACK (SCBA) ☐ FIRE RESISTANT CLOTHING
☐ CHEMICAL SUIT ☐ HEARING PROTECTION ☐ HOOD ☐ BARRICADES/WARNING SIGN ☐ SUPPLIED AIR ☐ LONG SLEEVES
☐ RUBBER BOOTS ☐ CHEMICAL GOGGLES ☐ FALL RESTRAINT DEVICE ☐ COMMUNICATIONS EQPT (EST) ☐ RESPIRATOR ☐ OTHER

3. THE PERSON RECEIVING THE PERMIT VERIFIES THAT ALL WORKERS:

A. HAVE BEEN THROUGH THE SAFETY ORIENTATION	☐ YES	E. KNOW THE LOCATION OF THE PHONE OR INTERCOM	☐ YES
B. UNDERSTAND APPLICABLE HAZCOM AND RADIATION REQUIREMENTS	☐ YES	F. KNOW THE PROCEDURES FOR SAFE JOB COMPLETION	☐ YES
C. HAVE DISCUSSED HAZARDS OF THE JOB AND AREA	☐ YES	G. HAVE INSPECTED ALL TOOLS/EQUIPMENT	☐ YES
D. KNOW THE LOCATION/USE OF SAFETY EQUIPMENT	☐ YES	H. UNDERSTAND THE CLEAN UP REQUIREMENTS	☐ YES

PERMIT RECEIVER INITIALS _____

4. POTENTIALLY AFFECTED AREA PERSONNEL AND WORKERS NOTIFIED OF WORK TO BE DONE ☐ YES ☐ N/A

5. THE FOLLOWING RESPONSIBILITIES HAVE BEEN COMMUNICATED TO THE PERSON RECEIVING THIS PERMIT:

☐ CONDITIONS FOR WORK STOPPAGE	☐ PERFORMING THE WORK SAFELY	☐ COMPLETION OF SECTION 6 AND PERMIT RETURN
☐ CREW ACCOUNTABILITY	☐ REPORTING CHANGES THAT AFFECT JOB SAFETY	

SECTION 2 — AIR TESTS

PRIOR TO ENTRY OR HOT WORK ☐ DOES NOT APPLY

TEST IN ORDER INDICATED

1. OXYGEN METER TEST PERFORMED	☐ YES ☐ N/A	READING	%O_2	RANGE 19.5-23 5% O_2	TESTED BY	LOCATION OF TEST	TIME ☐ AM ☐ PM
2. COMBUSTIBLE GASES AND VAPORS TEST	☐ YES ☐ N/A	READING	%LEL	MAXIMUM 10% LEL	TESTED BY	LOCATION OF TEST	TIME ☐ AM ☐ PM
3. TESTS FOR TOXICS	☐ YES ☐ N/A	READING	☐ PPM ☐ MA/M^3	PEL/TLV ☐ PPM ☐ MA/M^3	TESTED BY	LOCATION OF TEST	TIME ☐ AM ☐

SECTION 3 — HOT WORK

☐ DOES NOT APPLY

	YES	N/A		YES	N/A
1. FIRE EXTINGUISHER (TYPE) _____ IS IT FULL?			8. GROUND LEAD ATTACHED TO WORK		
2. SURVEY AREA FOR COMBUSTIONS AND OPENINGS, HOSES, TRENCHES, ETC.			9. PREVENTION OF HEAT EXPOSURE TO GASKET, SEALS, LINERS		
3. COMBUSTIBLE MATERIALS REMOVED OR PROTECTED			10. OTHER WORK IN AREA WHICH SHOULD BE STOPPED		
4. HEAT/SPARK CONTROL - TARPS, COVERS, WATER, ETC.			11. MATERIAL PRESENT WHICH EMITS VAPOR WHEN HEATED		
5. PRECAUTION TAKEN FOR HIDDEN COMBUSTIBLES			12. RADIANT HEAT TRANSFER CONSIDERED		
6. PURGE GAS USED. TYPE			13. EQUIPMENT OPERATING OR CONTAINS ORIGINAL CONTENTS		
7. ADJACENT AREAS SAFE/SEWERS PROTECTED			14. DUCTS OR CONVEYORS PLUGGES OR PROTECTED		

SECTION 4 — CONFINED SPACE

☐ DOES NOT APPLY

	YES	NO	N/A		YES	NO	N/A
1. CONFINED SPACE ENTRY REQUIRED?				5. HAVE AUTHORIZED ENTRANTS SIGNED OPPOSITE SIDE OF THIS FORM?			
2. SPACE TO BE ENTERED				6. HAVE DESIGNATED ATTENDANTS SIGNED OPPOSITE SIDE OF THIS FORM?			
3. PURPOSE OF ENTRY				7. HAVE ALL NECESSARY HAZARD CONTROL MEASURES BEEN TAKEN?			
4. IS SPACE A PERMIT-ENTRY SPACE? IF YES, COMPLETE OPPOSITE COLUMN				8. HAS ALL REQUIRED EQUIPMENT BEEN PROVIDED?			

SECTION 5 — TRENCHING/EXCAVATION

☐ DOES NOT APPLY

	YES	NO	N/A		YES	NO	N/A
1. HAS THE AREA BEEN INSPECTED FOR UNDERGROUND POWER LINES OR PRODUCT LINES?				4. HAVE PRECAUTIONS BEEN TAKEN IF THE TRENCH/EXCAVATION DEVELOPS INTO A CONFINED SPACE?			
2. DOES THE TRENCH REQUIRE SHORING/BRACING/SUPPORT?				5. HAVE OVERHEAD POWER/PRODUCT LINES BEEN REMOVED OR IDENTIFIED?			
3. HAS THE SOIL BEEN EVALUATED FOR STABILITY?				6. WILL LEAKING WATER OR RAIN WATER AFFECT THE STABILITY OF THE TRENCH/EXCAVATION?			

SAFE WORK PERMIT (Page 2 of 2)

SECTION 6			YES	NO	N/A		YES	NO	N/A
	QUESTIONS TO BE COMPLETED ON PERMIT EXPIRATION OR JOB COMPLETION.	1. HAS THE JOB BEEN COMPLETED?				5. HAVE SAFETY DEVICES BEEN REINSTALLED?			
	WORKER CLOSEOUT SIGNATURE	2. HAS THE AREA BEEN CLEANED OF WORK MATERIAL?				6. HAS HOT WORK AREA BEEN SURVEYED FOR SMOLDERING MATERIALS?			
	TIME ☐ AM ☐ PM	3. HAVE MANAGEMENT PERSONNEL BEEN INFORMED JOB IS DONE?				7. SPECIAL PRECAUTIONS, CONCERNS OR REMARKS			
		4. HAVE ALL LOCKS AND/OR TAGS BEEN REMOVED?				COMMENTS:			

I HAVE BEEN INSTRUCTED AS A CONFINED SPACE ATTENDANT, SAFETY WATCHER OR RESCUER AND UNDERSTAND MY DUTIES.

OBSERVERS, WATCHERS, RESCUERS

SIGNATURE	DATE	SIGNATURE	DATE

I HAVE BEEN INSTRUCTED IN AND AM AWARE OF THE POSSIBLE HAZARDS AND CONDITIONS I MAY ENCOUNTER IN THIS ENTRY WORK

PERSONS AUTHORIZED TO PERFORM WORK AND/OR TO ENTER CONFINED SPACE

SIGNATURE	TIME		DATE	SIGNATURE	TIME		DATE
	IN	OUT			IN	OUT	

COMMENTS

AUDIT PURPOSE ONLY

CORRECTIVE ACTIONS

COMPLETED BY	NAME	TITLE	DATE

FIGURE 5.3
SITE SAFETY PLAN
LOW CONTAMINATION OF FUEL,
CHLORINATED PESTICIDES AND PNAs IN SOILS

SUMMARY INFORMATION

DATE: _____ UPDATE: _____

PROJECT NAME: _____ PROJECT NO: _____

LOCATION: _____

SITE CONTACT AND PHONE NUMBER: _____

TYPE OF FACILITY: (active or inactive - describe previous use, previous agency action, soil type, topography, surrounding community)

PLAN PREPARED BY: _____

SITE SAFETY OFFICER: _____ CPR/FIRST AID TRAINED STAFF: _____

REVIEWED BY: _____ DATE: _____

WORK SCOPE/CONSTRUCTION/INVESTIGATION
Task 1 _____
Task 2 _____
Task 3 _____

PROPOSED START DATE: _____

UNUSUAL FEATURES/SITE SECURITY (include site map): _____

UTILITIES: ☐ Marked ☐ Scheduled Meet Date _____ Time _____

ANALYTICAL DATA (to be summarized below or attached, if available)

_____
_____

CONFINED SPACE: ☐ Yes ☐ No (If yes, describe and address permitting and entry procedures in an attachment.) _____
_____

AIR MONITORING:
Monitoring equipment: HNu meter with 10.2 eV lamp or _____
Action level = 15 PID units in breathing zone for Level C upgrade. Stop work = 50 PID units in breathing zone.
☐ 0_2 meter, ☐ FID, ☐ Detector tubes, ☐ L.E.L. meter, ☐ Other _____

Other action levels: _____

PERSONAL PROTECTION: Level of Protection: ☐ A ☐ B ☐ C ☐ D
Special Requirements_____

COMMUNICATION EQUIPMENT: (Mobile Phone or other phone location and number, etc.)

_____

Scheduled Safety Meetings Interval: (daily, weekly, as needed)

SPECIAL SITE EMERGENCY COMMUNICATION PROCEDURES: (Evacuation signals, routes, spill containment)

HEAT/COLD STRESS CONTROLS:

SPECIAL PHYSICAL HAZARD CONTROLS: Barricades for work area, reflective vests, other, etc.

_____

LOCAL EMERGENCY RESOURCES AND TELEPHONE NUMBERS
Emergency Eye Wash/Shower Location:
Fire Extinguisher: _____
Police: _____
Fire Department: _____
Poison Control: _____
HOSPITAL: _____
Address: _____
Telephone: _____
Directions (supply map): _____
_____

EMERGENCY CONTACTS (name and phone number)
1. Construction Manager Contact: _____
2. Owner Contact: _____
3. Contractor Contact: _____
4. Subcontractor Contact: _____
5. Subcontractor Contact: _____
6. _____
7. _____

PRE-ENTRY SAFETY BRIEFING
I have received and read the _____ Low Contamination Health and Safety Plan. I understand the plan and had the opportunity to ask questions. I understand the information and instructions in the plan. I understand that medicine can complicate the effects from exposure to toxic chemicals. If I am taking any prescription or over the counter medicine or have a current medical condition which may increase my risks, I will advise my supervisor or Site Safety Officer.

Signature	Responsibility	Date
_____	_____	_____
_____	_____	_____
_____	_____	_____

6.0 COMMUNICATIONS

6.1 General Communications

The Field Team Leader will have available at the Site the means for telephone communications, or an equivalent means of communication, for summoning emergency assistance from the fire/ambulance and police departments in the event they are required. The telephone will also act as a direct link to technical personnel for information pertaining to all phases of the project.

6.2 Radio/Telephones

Short-range walkie-talkies or cellular telephones will be made available to designated personnel working at the Site.

6.3 Emergency Warning

In the event of an emergency condition, the Field Team Leader will notify project personnel verbally if all are within immediate hearing and via a bullhorn if the Site area is large. The Field Team Leader will also notify visitors present within the area. Site personnel will immediately proceed to a pre-designated assembly area as designated by the Field Team Leader during the daily safety meeting. Personnel will remain in the designated area until further instructions are received by the Field Team Leader.

All communication equipment will be tested at the beginning of each day to verify operational integrity.

6.4 Hand Signals

Hand signals will be used by field teams in conjunction with the buddy system. Hand signals shall be familiar to the entire field team before operations commence and should be reviewed during site-specific training.

Signal	Meaning
Hand gripping throat	Out of air; can't breathe
Grip partner's wrist	Leave area immediately; no debate
Hands on top of head	Need assistance
Thumbs up	OK; I'm all right; I understand
Thumbs down	No; negative

6.5 Site Security

Only authorized personnel will be permitted on the Site in accordance with the requirements of this HASP. Visitors and other non-essential personnel may enter the work area only upon authorization by the Field Team Leader. This restricted access will ensure that the Field Team Leader can communicate with each person authorized to enter the work area.

7.0 PERSONNEL EXPOSURE AND AIR QUALITY MONITORING

7.1 Air Quality (Dust)

Due to the nature of the principal contaminants associated with the project (radiation and PAHs), dust suppression will be important as a means of minimizing exposure levels and off-site migration of contaminants. A key control measure to minimize exposure levels and off-site migration of contaminants will be a policy of "no visible dust". The Field Team Leader will routinely monitor the project area. Acceptable dust levels (controlling all visible dust) will result in airborne dust levels of less than 1 mg/m^3. The OSHA nuisance dust standard of 15 mg/m^3 is not acceptable at this site, because of contaminants in the dust.

7.2 Airborne Radioactivity Monitoring

Monitoring for airborne radioactivity exposure is as important as monitoring for external radiation exposure. Monitoring for airborne radioactivity exposure requires the following elements:

- Air sampling for radioactive particulates,
- Recordkeeping regarding personnel work locations and time in location,
- Respiratory protective equipment records regarding devices used by workers in airborne radioactivity areas,
- Counting and analyzing air sample filters,
- Calculating air concentrations of radioactive material, and
- Comparing air concentrations to applicable air quality criteria

By closely monitoring these elements, a continuous record of personnel exposure to airborne radioactivity is maintained.

Lapel samplers worn for personal air monitoring shall be utilized for airborne radioactivity monitoring any time a worker enters a radiological exclusion zone. The filters from the lapel samplers shall be analyzed the following day after use for comparison purposes to assess the need for procedural changes. It is expected that naturally occurring radon and thorium daughters will interfere with analyses. Additional evaluation of samples shall be performed when determined necessary based upon elevated results. If sample analysis shows concentrations greater than background levels a follow-up analysis shall be performed. The follow-up analysis shall be performed after four days to allow for the decay of the thoron daughter ^{212}Pb (10.6 hour half life). The "four day count" should be free from radon daughter interference and will serve as the official measurement of Th-Alpha.

High volume air samplers shall be utilized so that effluent air quality can be gathered on a daily basis. High volume air sampling allows for much shorter collection times than low volume sampling and has equivalent dust loading for needed collection durations. Both high and low volume air samplings require a sufficient volume of air to be collected in order for the Minimum Detectable Activity (MDA) to be below the most restrictive air effluent guidelines. Daily analysis of samples will allow for necessary procedural changes to be made and alert health and safety staff to potential problems on a continuous basis, rather than once per week.

Time decay of interfering nuclides generally refers to radon-222 decay and daughters but may also include thoron decay. The specific times for decay of samples are best addressed in procedures rather than in the health and safety plan.

After filters have been collected and decayed overnight, there will be a morning count of the filter that will serve to identify high gross counts for the previous day. This will alert health and safety staff of a potential problem which they can investigate more promptly. The count, after 4 days decay, will serve to be the official measurement of Th-Alpha.

7.3 Internal Monitoring

Internal monitoring to determine intakes of radioactive material will be performed as needed based upon the results of the air sampling program. Bioassay methods to be considered should include in-vivo, as well as in-vitro, assessments. Routine bioassay of workers is not anticipated based upon the low concentrations of radioactivity in soils to be excavated.

7.4 External Radiation Monitoring

External radiation monitoring of workers will be performed using film badges or thermoluminescent dosimeters. Dosimetry will be provided and processed by a service holding National Voluntary Laboratory Accreditation Program (NVLAP) certification. Pocket dosimeters may also be utilized for visitors and other infrequent personnel requiring access to the Site.

7.5 Radiological Surveys

Radiological surveys will be performed to ensure that radiation levels and contamination levels are within applicable guidelines for workers and the general public. Radiation surveys will be performed using the following instrumentation:

- Ludlum Model 2221 Portable Scaler/Ratemeter with 2"x2" NaI probe (or equivalent). This instrument will be used to conduct surface soil scans. Instrument specific action levels shall be used to determine approximate radiological soil concentrations. Any areas where the count rate is greater than the determined action level shall be considered exclusion zones and marked appropriately.

- Ludlum Model 3 Survey Meter with pancake G-M probe (or equivalent). This instrument will be used to conduct surveillance surveys of both personnel and equipment leaving exclusion zones. The action level for both equipment and personnel surveys is any count rate that exceeds background level. Decontamination procedures detailed in section 9.0 of the HSP will be used when contamination is located.

- Ludlum Model 3 Survey Meter with 1"x1" NaI probe "MicroR meter" (or equivalent) and Eberline Model RO-2 Ion Chamber (or equivalent). These instruments will be used periodically to ensure that dose rates in work areas as well as the Site perimeter are below prescribed levels. The action levels for both on and off site are detailed in Section 7.8 of the HSP in Table 7.1

Airborne radioactivity measurements will be performed as described in the Air Monitoring Procedure (Appendix E to the Removal Action Work Plan).

7.6 Contamination Monitoring

Samples shall be obtained periodically in work areas to ensure that radioactivity is present at acceptable levels and is prevented from leaving the Site. Decontamination of elevated areas will be performed to maintain contamination at levels that are ALARA.

Before leaving the exclusion zone, Site personnel shall be checked through use of a hand-held frisker to ensure that contamination is not present on skin or clothes. The frisker will be a Ludlum Model 3 survey meter with a pancake G-M probe (or equivalent). The trigger level for frisking will be any detectable counts above background in accordance with ALARA practices. The Field Team Leader will be immediately informed regarding any contamination on individuals and will initiate appropriate decontamination techniques. Proper disposition of contaminated personal effects and clothing also will be the responsibility of the Field Team Leader.

7.7 Total Organic Vapor Monitoring

In addition to the radiological contaminants, there is a very slight potential of encountering organic vapors. Thus, no routine screening for organic vapors will be conducted during the removal action. However, if organic odors are encountered during the field work screening for total organic vapors will be conducted with a photoionization detector (PID), or similar type equipment, on a daily basis. The screening will evaluate ambient photoionization volatile organic vapors and some semivolatile organic vapors.

Total organic vapors in ambient air will be obtained periodically with a PID during daily field activities. The PID provides real-time readings of exposure to volatile organics and some semi-volatile organics. Measurements will be made daily, prior to activities, to determine background levels. Monitoring measurements will be taken when:

- operations change,
- work moves to a different portion of the Site, and
- personnel observe contaminated materials.

These screening operations will be used to identify conditions requiring an upgrade to full-face respirators as described in Section 7.8.2.

7.8 Action Levels

7.8.1 Radiological Action Levels

Radiological action levels for on-site workers will be determined by performing surveillance surveys as well as airborne particulate monitoring for the presence of radioactivity. Properly trained Health Physics Technicians will perform radiological monitoring. The radioactive contamination on the Site is particulate and insoluble in water. Therefore, there will be no fixed contamination on the workers. Action levels as determined by radioactive monitoring can be found in Table 7.1.

To avoid the need for upgrade of personal protection equipment due to airborne contamination, engineering controls such as the use of water to minimize dust levels will be implemented as necessary during excavation and restoration activities.

7.8.2 Organic Vapors Action Levels

AECOM is taking a conservative approach to organic vapor monitoring at the Site. A PID will be used to periodically monitor for organic vapors or when odors indicated the possibility of organic contamination. Operations will be discontinued if the PID reads 5 ppm or greater above background and the area will be evacuated. The Site Health and Safety Officer will retest the area wearing a full-face respirator. Operations will not resume until the PID reads less than 5 ppm, and remains below 5 ppm.

TABLE 7-1
ACTION LEVELS AS DETERMINED BY RADIOACTIVITY

Note:

Personnel shall not be exposed to airborne radioactivity such that their weekly intake exceeds 12 Derived Air Concentration (DAC)-hours without prior approval of the Field Team Leader or designee.

Level of protection may be increased to Level C (full-face air purifying respirator) when airborne monitoring indicates that contamination levels have reached 30% of the DAC. All assessments shall incorporate ALARA principles. Engineering controls shall be used prior to assignment of respiratory protective equipment.

Signs shall be posted at entrances to areas where airborne radioactivity levels exceed, or have the potential to exceed, 25% of the DAC.

The most restrictive DAC of the nuclides which may be present onsite is Th-232. The DAC for Th-232 Class W is $5x10^{-13}$ uCi/ml. The air effluent limit is $4x10^{-15}$ uCi/ml. Engineering controls will be utilized so that no visible dust is present and airborne radionuclide concentrations will be kept ALARA.

Radiation Type	Action Level	Level of Respiratory Protection/Action
a. Contamination on smear samples of equipment	20 dpm/100 cm^2 gross alpha	Decontamination required prior to release for unrestricted use.
b. Contamination surveys of personnel or equipment	Count rate greater than background levels	Decontamination required prior to leaving exclusion zone.
c. Airborne Radioactivity	30% DAC[(c)]	Consider Level C (full-face APR) based upon ALARA evaluation. Ensure proper posting. Consider internal monitoring
d. Ambient Gamma (work areas)	5 mrem/hr[(d)]	Consider procedures for shielding of soils. Ensure proper posting.
e. Ambient Gamma (off-site areas)	2 mrem/hr[(e)]	Implement immediate controls to reduce dose equivalent rate.

Notes

(c) Potential Airborne Radioactivity Area as defined in 10 CFR 20. Workers with 1000 DAC-hours per year to date must wear modified Level C (full-face APR) until the end of the calendar year.

(d) The ambient gamma dose equivalent rate action level of 5 mrem/hr stems, from the 10 CFR 20 radiation area definition. If the ambient gamma dose equivalent rate reaches 2 mrem/hr, one or more of the following actions will be implemented: The source may be shielded; the working distance from the source may be increased; or the worker's exposure time may be limited.

(e) The ambient gamma action level for off-site is based upon the 10 CFR 20 requirements to maintain dose equivalent rates in unrestricted areas such that they do not exceed 0.002 rem in any one hour.

8.0 PERSONAL PROTECTIVE EQUIPMENT

It is anticipated that most excavation activities in designated exclusion zones can be conducted in Level D personal protective equipment (PPE), with a contingency upgrade to Level C, based on the action levels listed in Section 7. Level C will be used when required by Special Work Permits, or when directed by the Field Team Leader.

Level D personal protective clothing and equipment for excavation activities includes:

- Coveralls, disposable or washable through a contaminated clothing vendor. Coveralls are to be removed at the boundary of the exclusion zone.
- Hard hat
- Steel toed boots and chemically resistant booties (exclusion zone)
- Cotton or leather gloves (no soil contact); Nitrile gloves (Edmont 37-15 or equivalent) 0.40 mm thickness to be used if hand contact with soils is probable.
- Safety glasses
- Dust mask (optional)

Level C protective clothing and equipment includes:

- Full-face air-purifying respirator (NIOSH/MSHA approved) fitted with radionuclides/HEPA cartridges and/or organic vapor cartridges, depending on which action levels are exceeded (see Section 7 of this HASP)
- Coveralls
- Tyvek coveralls - required in areas when splashing by contaminated soils or water is a possibility
- Nitrile gloves (Edmond 37-15 or equivalent) 0.40 mm thickness
- Disposable latex inner gloves - required in areas when splashing by contaminated soils or water is a possibility
- Nitrile outer gloves (taped) - required in areas when splashing by contaminated soils or water is a possibility
- Steel toe boots with outer chemically resistant booties (taped)
- Hard hat

Action levels used to determine the need to upgrade or downgrade the levels of protection are described in Section 7 of this HASP.

9.0 CONTAMINATION REDUCTION PROCEDURES

9.1 Equipment

Portable equipment will be decontaminated with soap and water and rinsed with tap water. Heavy equipment will be steam-cleaned with water and, if necessary, a detergent solution.

9.2 Personnel

If levels of radioactivity show that individuals can remove coveralls and other personal protective clothing and equipment before leaving the exclusion zone and, thus complete decontamination, the individuals may leave the exclusion zone. If, however, levels of radioactivity show that individuals cannot achieve decontamination by the removal of coveralls and showering is required, they will be dressed in clean coveralls, boots and gloves and be transported to Northwestern Memorial Hospital to complete decontamination.

If substantial skin contamination occurs on an individual working with radioactive materials, the following specific procedures should be followed to prevent fixation of the material in the skin or absorption of the radioactivity through the skin.

Immediate Action: Notify the HSC or Field Team Leader, who will supervise the decontamination. If contamination is spotty, the HSC or Field Team Leader will supervise the cleaning of the individual spots with swabs, soap, or water. If the contamination is general, the HSC or Field Team Leader may recommend washing the area gently in warm or cool water (not hot) using hand soap (not detergent) for one minute. Rinse, dry, and monitor for radioactivity. This soap wash step may be repeated three times.

Evaluation: If the above procedure fails to remove all the skin contamination, the treatment should cease. An evaluation of the skin contamination should be performed by the HSC or Field Team Leader including an estimate of the dose commitment to the skin, and the quantity and identity of the nuclides contaminating the skin If additional decontamination steps are necessary, they are performed and documented by the HSC. The guidelines for Personnel Decontamination in the Radiological Health Handbook, HEW 1970, beginning on page 194, can be used as applicable. **CAUTION**: Do not use chemicals for personnel decontamination until full evaluation of the contamination is made by the HSC or Field Team Leader.

9.3 Contamination Prevention

Work practices that minimize the spread of contamination will reduce worker exposure and help ensure valid sample results by precluding cross-contamination. Procedures for contamination avoidance include:

- Knowing the limitations of all personal protective equipment being used;
- Avoiding walking through areas of obvious or known contamination;
- Refraining from handling or touching contaminated materials directly. Do not sit or lean on potentially contaminated surfaces;
- Ensuring personal protective equipment has no cuts or tears prior to donning;
- Fastening all closures on suits, covering with tape if necessary;
- Taking steps to protect against any skin injuries;
- Staying upwind of airborne contaminants; and
- When working in contaminated areas, refraining from eating, chewing gum, smoking, or engaging in any activity from which contaminated materials may be ingested

9.4 Disposal Procedures

All discarded materials, waste materials, or other field equipment and supplies should be handled in such a way as to preclude the spread of contamination, creating a sanitary hazard, or causing litter to be left on-site. All potentially contaminated waste materials (i.e., clothing, gloves) shall be monitored and segregated in accordance with monitoring results into either radioactive or non-radioactive waste. Appropriate labels shall be affixed to all containers of radioactive materials.

10.0 GENERAL WORK PRECAUTIONS

10.1 General Work Precautions

The following general work precautions apply to all Site personnel.

- Eating, drinking, chewing gum or tobacco, smoking, or any practice that increases the probability of hand-to-mouth transfer and ingestion of material is prohibited in the work area.
- Hands and face must be thoroughly washed upon leaving the work area. Wash water will be provided at the Site for this purpose.
- Whenever levels of radioactivity warrant, the entire body should be thoroughly washed, as soon as possible, after the protective coveralls and other clothing are removed as part of the decontamination process.
- No facial hair that interferes with a satisfactory fit of the mask-to-face-seal is allowed on personnel required to wear respirators.
- Contact with contaminated or suspected contaminated surfaces should be avoided. Whenever possible, do not walk through puddles, leachate, discolored surfaces, kneel on ground, lean, sit, or place equipment on drums, containers, or the ground.
- Medicine, drugs and alcohol may interfere with or impair judgment and reaction times. Therefore, usage of prescribed drugs must be specifically approved by a qualified physician and made known to the Field Team Leader prior to an individuals' presence on the work-site. Alcoholic beverage intake is strictly prohibited at the Site and prior to work.
- All personnel must be familiar with standard operating procedures and any additional instructions and information contained in the HASP.
- All personnel must adhere to the requirements of the HASP.
- Contact lenses are not permitted when respiratory protection is required or where the possibility of a splash exists.
- Personnel must be cognizant of symptoms for radiological exposure onsite, for heat stress and cold stress, and knowledgeable regarding emergency measures contained in the Emergency Contingency Plan.
- Respirators shall be cleaned and disinfected after each day's use or more often, if necessary.
- Prior to donning, respirators shall be inspected for worn or deteriorated parts. Emergency respirators or self-contained devices will be inspected at least once a month and after each use.
- Each employee shall be familiar with the project's Respiratory Protection Program.

10.2 Operational Precautions

The following operational precautions must be observed at all times.

- All Site personnel shall be adequately trained and thoroughly briefed on anticipated hazards, equipment to be worn, safety practices to be followed, emergency procedures, and communications.
- All required respiratory protective devices and clothing shall be worn by all personnel going into areas designated for wearing protective equipment.
- All Site personnel shall use the buddy system when wearing respiratory protective equipment. At a minimum, a third person, suitably equipped as a safety backup, is required during extremely hazardous entries.
- During continual operations, on-site workers act as a safety backup to each other. Off-site personnel provide emergency assistance.
- Personnel should practice any unfamiliar operations prior to undertaking the actual procedure.
- Entrance and exit locations shall be designated and emergency escape routes delineated. Warning signals for Site evacuation must be established.
- Personnel and equipment in the contaminated. work area should be minimized, consistent with effective Site operations.
- Work areas for various operational activities shall be established.

- Procedures for leaving a contaminated area shall be planned and implemented prior to going on-site. Work areas and decontamination procedures shall be established based on expected Site conditions.
- Frequent and regular inspection of Site operations will be conducted to ensure compliance with the HASP. If any changes in operation occur, the HASP will be modified to reflect those changes.

11.0 SANITARY FACILITIES

11.1 Potable Water

a. An adequate supply of potable drinking water shall be maintained at all times immediately outside the Site. Drinking water shall meet all federal, state and local health requirements.
b. Drinking water shall be supplied to project personnel via approved dispensing sources.
c. Paper cups shall be permitted for the drinking of potable water supplies.
d. Drinking water dispensers shall be clearly marked and shall, in no way, have the potential for contamination from non-potable supplies.
e. Site personnel must be fully decontaminated prior to approaching the drinking water supply.

11.2 Toilet Facilities

a. Adequate toilet facilities shall be provided at the Site.
b. These facilities shall be in the form of portable chemical toilets.
c. Routine servicing and cleaning of the toilets should be established with the selected contractor and shall be in accordance with federal, state, and local health regulations.
d. Site, personnel must be fully decontaminated prior to approaching the toilet facilities.

11.3 Washing Areas

a. Adequate washing areas shall be provided for personal use within the work area.
b. Washing areas shall be maintained in a sanitary condition and will be provided with adequate supplies of soap, towels for drying, and covered waste receptacles.
c. Washing areas shall be maintained and sanitized daily.
d. No eating, drinking or smoking shall be permitted in the work area. This policy will be strictly enforced by the Field Team Leader.

12.0 FIRE CONTROL EQUIPMENT

An adequate number of approved portable fire extinguishers (class rated A, B and C) shall be readily available at the Site at all times.

All Site personnel shall be trained in the use of the extinguishers. Extinguishers shall only be used on outbreak stage fires or fires of minor nature. The local fire department shall be contacted in the event of a larger fire and Site evacuation procedures should be commenced in accordance with the procedures described in the Emergency Contingency Plan.

13.0 CONFINED SPACE PROGRAM

13.1 Purpose

In the event that confined space work is a necessity, a Confined Space Program will be implemented. Training in the recognition of confined spaces is a component of the health and safety training program.

The purpose of the Confined Space Program is to establish procedures to protect personnel from this serious hazard in the course of their work; and at a minimum, to comply with 29 CFR OSHA 1910.146. This document assigns responsibilities and sets standards for personnel engaged in activities where confined spaces may be present.

13.2 Responsibilities

13.2.1 Health and Safety Coordinator

The Health and Safety Coordinator administers the Confined Space Program. The Health and Safety Coordinator's responsibilities include:

- Review of the HASP for potential confined space hazards and design alternative approaches to accomplish the confined space tasks;
- Coordinating and managing the Confined Space Program in the event one is required;
- Establishing priorities for implementation of the program;
- Assisting with recognition and implementation of the Confined Space Program;
- Advising project management on confined space issues; and
- Communicating the Confined Space Program to personnel by training related to specific Site activities.

13.2.2 Project Manager

The Project Manager directs the application of the Confined Space Program to project work. The Project Manager is responsible for:

- Working with the Health and Safety Coordinator to prepare information describing activities that might be conducted in a confined space area;
- Assuring that all personnel engaged in project activities are familiar with the definition of a confined space;
- Assuring that personnel are familiar with the Confined Space Program, and that project activities are conducted in compliance with the Confined Space Program;
- Assuming the responsibilities of the Field Team Leader if another person is not assigned these responsibilities.

13.2.3 Field Team Leader

The Field Team Leader is responsible for the implementation of the Confined Space Program on-site during field activities. The Field Team Leader is responsible for:

- Overseeing implementation of the Confined Space Program during field operations; and
- Reporting confined space work activity, and any violations of the Confined Space Program, to the Project Manager and the Health and Safety Coordinator.

13.2.4 Personnel

Personnel are responsible for:

- Familiarizing themselves with the Confined Space Program and following it;
- Becoming familiar with the criteria for determining a confined space, and with the monitoring, permitting, and other requirements of the program; and
- Reporting immediately a confined space condition to the Field Team Leader.

13.3 Definition of a Confined Space

Confined space means a space that:

1. Is large enough and so configured that an employee can bodily enter and perform assigned work
2. Has limited or restricted means for entry or exit (such as pits, storage bins, hoppers, crawl spaces, and storm cellar areas)
3. Is not designed for continuous employee occupancy

Any workspace meeting all of these criteria is a confined space and the Confined Space Program must be followed.

13.4 Confined Space Entry Procedures

13.4.1 Safety Work Permit Required

All spaces shall be considered permit-required confined spaces until the pre-entry procedures demonstrate otherwise. The Safe Work Permit for entry into a confined space must be completed before work begins; it verifies completion of the items necessary for confined space entry. The Permit will be kept at the Site for the duration of the confined space work. If there is an interruption of work, or the alarm conditions change, a new Permit must be obtained before work begins.

A permit is not required when the space can be maintained for safe entry by 100% fresh air mechanical ventilation. This must be documented and approved by the Health and Safety Coordinator. Mechanical ventilation systems, where applicable, shall be set at 100% fresh air.

The Field Team Leader must certify that all hazards have been eliminated on the Entry Permit. If conditions change, a new permit is required.

13.4.2 Pre-entry Testing for Potential Hazards

a. Surveillance

Personnel first will survey the surrounding area to assure the absence of hazards such as contaminated water, soil, or sediment, barrels, tanks, or piping where vapors may drift into the confined space.

b. Testing

No personnel will enter a confined space if any one. of these conditions exists during pre-entry testing. Determinations will be made for the following conditions:

1. Presence of toxic gases or dusts: Equal to or more than 5 parts per million (ppm) on the organic vapor analyzer with an alarm, above background outside the confined space area; or other action levels for specific gases, vapors, or dusts as specified in the Health and Safety Plan and the Confined Space Permit based on knowledge of Site constituents;

2. Presence of explosive/flammable gases: Equal to or greater than 10% of the Lower Explosive Limit (LEL) as measured with a combustible gas indicator or similar instrument (with an alarm); and

3. Oxygen Deficiency: A concentration of oxygen in the atmosphere equal to or less than 19.5% by volume as measured with an oxygen meter.

Pre-entry test results will be recorded and kept at the Site for the duration of the job by the Field Team Leader. Affected personnel can review the test results.

c. Authorization

Only the Field Team Leader and the Health and Safety Coordinator can authorize any personnel to enter into a confined space. This is reflected on the Safe Work Permit for entry into a confined space. The Field Team Leader must assure that conditions in the confined space meet permit requirements before authorizing entry.,

d. Safe Work Permit

1. A Safe Work Permit for confined space entry must be filled out by the Health and Safety Coordinator or Field Team Leader. A copy of the Safe Work Permit is included as Figure 5.2.

e. Attendants

One worker will stand by outside the confined space ready to give assistance in the case of an emergency. Under no circumstances will the standby worker enter the confined space or leave the standby position. There shall be at least one other worker not in the confined space within sight or call of the standby worker.

f. Observation and Communication

Communications between standby worker and entrant(s) shall be maintained at all times. Methods of communication that may be specified in the Safe Work Permit and the HASP may include voice, voice by powered radio, tapping or rapping codes, signaling tugs on rope, and standby worker's observations that activity appears normal.

13.4.3 Rescue Procedures

Acceptable rescue procedures include entry by a team of rescuers only if the appropriate self-contained breathing apparatus (SCBA) is available; or use of public emergency services.

The standby worker must be trained in first aid, CPR, and respirator use. A first aid kit should be on hand and ready for emergency use. The standby worker must be trained in rescue procedures. Retrieval of an unconscious victim in a confined space will only be conducted by trained rescue personnel. An emergency call to 911 will be initiated to assist the victim.

13.5 Training

Personnel who will engage in field activities will be given annual training on the requirements and responsibilities in the Confined Space Program and on OSHA 1910.146. Only trained personnel can work in confined spaces. Workers should be experienced in the tasks to be performed, instructed in proper use of respirators, lifelines and other equipment, and practice emergency procedures and self-rescue.

Before each Site activity, the determination of confined space work will be part of the Site characterization process. Training in the site-specific confined space activities will be part of the site-specific health and safety training:

13.6 Safe Work Practices

- Warning signs should be posted. These include warnings for entry permits, respirator use, prohibition of hot work and emergency procedures and phone numbers.
- Cylinders containing oxygen, acetylene or other fuel such as gasoline must be removed a safe distance from the confined space work area.
- Purging and ventilating is done before work begins to remove hazardous vapors from the space. The space should be monitored to ensure that the gas used to purge the space (e.g. tank) has also been removed. Local exhaust should be used where general exhaust is not practical.
- The buddy system is used at all times. A standby person always must be posted within sight of, or in communication with, the person inside the confined space. The standby should not enter the confined space, but instead will call for help in an emergency and not leave the post. Communication should be maintained at all times with workers inside the confined space.
- Emergency planning in the HASP and a Safe Work Permit must be approved in advance and the proper rescue equipment must be immediately available.

14.0 ELECTRICAL LOCKOUT/TAGOUT

The Field Team Leader must approve all work in areas requiring lockout/tagout procedures. Specific procedures and permitting requirements will be specified in the HASP, or in a revised HASP based on the need for a worker to work around electrical equipment.

All systems must be locked out and tagged before the work begins. This includes pipes, air lines, electrical equipment and mechanical devices. The equipment must be start tested and approved for use by a worker by the Health and Safety Coordinator or the Field Team Leader by start-testing to make sure the locked-out equipment does not operate.